UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN WYOMING, FISCAL YEAR 1980

By S. L. Green

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Cheyenne, Wyoming

1981

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, Secretary

GEOLOGICAL SURVEY

H. William Menard, Director

FUNDING AGENCIES

State Agencies

Wyoming Department of Agriculture
Wyoming Department of Economic Planning and Development
Wyoming Department of Environmental Quality
Wyoming Department of Game and Fish
Wyoming Highway Department
Wyoming State Engineer

Municipality

City of Cheyenne

Federal Agencies

Bureau of Indian Affairs
Bureau of Land Management
Corps of Engineers
Department of Energy
Environmental Protection Agency
Geological Survey
National Park Service
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WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN WYOMING, FISCAL YEAR 1980

by S. L. Green

INTRODUCTION

The Water Resources Division of the U.S. Geological Survey is the Federal agency responsible for appraising the quantity, quality, and distribution of our surface-water and ground-water resources. The division conducts interpretive studies, supports hydrologic research, and maintains data-collection networks in every State; it also works through cooperative programs with State, local, and other Federal agencies to help evaluate or solve regional and local water problems. Results of its investigations provide a basis for nearly all major public water-management decisions.

The U.S. Geological Survey, in cooperation with the State of Wyoming, the city of Cheyenne, and other Federal agencies, has five data-collection activities and 34 water-resource appraisal projects in Wyoming during fiscal year 1980 (October 1, 1979, through September 30, 1980).

The data-collection activities include: (1) Collection of records for streamflow and reservoir storage; (2) measurements of water levels in wells; (3) sampling and chemical analysis of water from streams and wells; (4) sampling and sediment analysis of surface water; and (5) collection of peak-flow information at partial-record sites. This report contains tables of monitoring sites for these five data-collection activities. Additional water-data are collected throughout the state in conjunction with water-resource appraisal projects. Information on these sites may be obtained from the district office.

Water resource appraisal projects described in the report include the projects currently being conducted during fiscal year 1980 and projects completed in previous fiscal years, but for which final reports are in preparation.

The purpose of this report is to describe the water-resources studies being done in Wyoming. The report is also intended to inform cooperating officials and the public about the accomplishments in the various investigations during the fiscal year 1980 (October 1, 1979, through September 30, 1980). It is one phase of an effort to coordinate the water-resources investigations of the U.S. Geological Survey with those of other organizations.

A BRIEF HISTORY OF THE WYOMING DISTRICT

On March 3, 1879, President Rutherford B. Hayes signed a bill establishing the U.S. Geological Survey. The Sundry Civil Appropriation Act of 1888 established an Irrigation Survey as a part of the U.S. Geological Survey "for the purpose of investigating the extent to which the arid region of the United States can be redeemed by irrigation ***." The Water Resources Division, of which the Wyoming District is a part, has its roots in the Irrigation Survey of 1888-1890. The following summary of the water-resources activities of the U.S. Geological Survey in Wyoming is included in this report in commemoration of the 100th anniversary of the U.S. Geological Survey.

There was no Wyoming District in 1888, when the Washington, D. C. office of the Survey paid the installation costs for the first gaging station in Wyoming, Laramie River at Woods Landing. It was constructed and operated by the Territorial Engineer, Elwood Mead. Between 1895 and 1901 the Survey paid operating expenses for additional stations operated by the State Engineer. A. J. Parshall became the first resident hydrographer for the Survey in Wyoming in 1901. For the next six years there was no cooperative work with the State, but 11 stations were operated with Survey and Reclamation Service funds. By 1912 the Survey's network consisted of 50 stations, including 21 in cooperation with the State Engineer. Parshall was appointed State Engineer; surprisingly, he refused to allow the Survey to use any part of its share of the funds to pay office expenses, so cooperation ended in 1912. The first official letter written by J. B. True as the new State Engineer in 1915 was to the Survey, urging resumption of the coop program. Fifty gaging stations were established or re-established; cooperation with the State Engineer has continued without further interruption.

Early Federal cooperators included the Indian Service (1908) and the Forest Service (1910). In 1938 the Bureau of Reclamation established 23 streamflow stations in the Green River Basin using Survey plans. The Bureau also did field work at Survey stations in the area; in return the Survey computed and published the records for all stations. During the postwar period, 1945-50, many new streamflow stations were established under the Interior Department's Missouri River Basin program. A flood-investigations program, started in 1959 in cooperation with the Wyoming Highway Department, has continued to the present.

Surface-water activities in Wyoming were directed from Washington until 1903, when the Denver District was established under M. C. Hinderlider. Between 1903 and 1961 Wyoming was part of the Colorado District, with local offices at various times in Kemmerer, Sheridan, and Casper. The Wyoming District, Surface Water Branch, was established in 1961, with L. A. Wiard as District Engineer.

The earliest known ground-water studies by the Survey in Wyoming were done between 1900 and 1917 by G. I. Adams in the Goshen Hole area (Water-Supply Paper 70); N. H. Darton in the Great Plains, Bighorn Mountains, Laramie Range, and Black Hills; and O. E. Meinzer in Lodgepole Valley. State cooperation has been continuous since 1940, when the Wyoming Planning and Water Conservation Board sponsored a study of the Egbert-Pine Bluffs area by T. W. Robinson. Cooperation with the State Engineer has continued since 1945. In 1959 all State cooperative ground-water work was consolidated under the State Engineer program. A large segment of the program activities of that part of Wyoming that lay in the Missouri River Basin was conducted by the staff of the Montana District during 1945-53 with funds made available under the Missouri River Basin (MRB) program. From 1949 to 1953, this was largely done from a Montana District field office at Riverton, Wyoming. From 1954 through 1959, the MRB program in Wyoming was accomplished through the district of Cheyenne. Ground-water work for other Federal agencies has also included measurements of discharge and power consumption for REA in 1941, and a continuous series of studies of Yellowstone and Grand Teton National Parks for the National Park Service since the early 1960's.

Ground-water work in Wyoming was directed from Washington until 1945, when Wyoming became a part of the Colorado District under S. W. Lohman. The local geologist in charge was A. M. Morgan. In 1951 (?) the Wyoming District, Ground Water Branch, was established, with H. M. Babcock as District Geologist.

Surface-water quality work in Wyoming began with the establishment of an office in Worland in March 1945, with T. F. Hanly in charge. A part of the MRB program was directed by P. C. Benedict, Regional Engineer, in Lincoln, Nebraska. In 1948, the chemical quality or sediment stations were in operation at 16 sites in the Bighorn Basin and 5 sites in the North Platte basin, under the Department's Missouri River Basin program. By 1953, the program included 39 CQ stations and 42 sediment stations.

In February 1956 Worland became a District Office, Quality of Water Branch, with a field office in Riverton; the Riverton office was reassigned to the Surface Water Branch in October 1964. The first sediment station in the State coop program was established on Rock Creek near Atlantic City for the Wyoming Natural Resources Board in 1957. The State Engineer started a cooperative chemical-quality program to evaluate the effects of the Kendrick Project on the North Platte River in 1959. Since 1965 the Wyoming Department of Agriculture has been principal State Cooperator for chemical quality and the State Engineer for sediment data. In 1966 water-quality work in the Green River basin, previously done by the Utah District, was transferred to the Wyoming District.

The District sediment laboratory has remained in Worland since the office was opened, and today serves the Montana and North Dakota Districts as well. The chemical lab moved to Cheyenne in 1969 and was immediately downgraded because of the establishment of the WRD Central Laboratory in Salt Lake City. Since 1966, however, basic salinity analyses of samples collected for the State programs have been done by the State laboratory in Laramie for Direct Services credit in the program with the Wyoming Department of Agriculture.

The Branch districts were combined into a single WRD district in February 1967. The programs and staff of the District changed little until 1974. Within two years the staff doubled and the budget tripled, mostly in response to the pending boom in development of coal and other energy resources. The water-quality data program, in particular, increased several-fold. Significant new programs were started in cooperation with the Wyoming Department of Environmental Quality, the Bureau of Land Management, and the Environmental Protection Agency.

Today the District has approximately 70 employees, with field offices in Buffalo, Casper, Green River, Riverton, and Worland. Approximately half of the funding is for work for other agencies, and half is for participation in the Survey' energy programs and regional aquifer assessments. Reconnaissance and inventory studies have given way to problem-oriented, multidisciplinary studies and increased use of digital models. For the immediate future the impacts of coal and uranium mining, the effects of human activity on water quality, and the increased development of ground water for irrigation will occupy much of the Wyoming District's effort.

The District Chiefs who have directed the Wyoming District are listed below:

Surface Water Branch:	Leon A. Wiard	10/61 - 2/67
Ground Water Branch:	Horace M. Babcock	10/51 - 1/58
	Ellis D. Gordon	2/58 - 2/67
Quality of Water Branch:	Thomas F. Hanly	2/56 - 2/67
Water Resources Division:	Leon A. Wiard	2/67 - 8/68
	Robert L. Cushman	8/68 - 6/73
	Sam W. West	12/73 - 12/78
	William W. Dudley, Jr.	4/79 - present

DISTRICT OFFICE ADDRESSES

Inquiries regarding projects described in this volume may be directed to the District Office or Subdistrict Office in which the work originated.

Wyoming District Office

U.S. Geological Survey
Water Resources Division
2120 Capitol Avenue
P.O. Box 1125
Cheyenne, WY 82001
(307) 778-2220 ext. 2153

Subdistrict Offices

215 N. Lincoln Street
Casper, WY 82601
(307) 265-5550

1214 Big Horn Avenue
Worland, WY 82401
(307) 347-2181

Field Headquarters

9 Spruce Street
P.O. Box S
Buffalo, WY 82834
(307) 684-9661

509 S. Federal Blvd.
P.O. Box 431
Riverton, WY 82501
(307) 856-3771

489 East 5th South
P.O. Box 1175
Green River, WY 82935
(307) 875-6700

Field Unit

2120 Capitol Ave.
P.O. Box 1125
Cheyenne, WY 82001
(307) 778-2220 ext. 2153

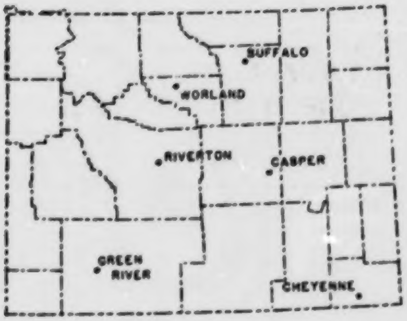


Figure 1.--Location of offices in Wyoming.

WYOMING DISTRICT ORGANIZATION CHART

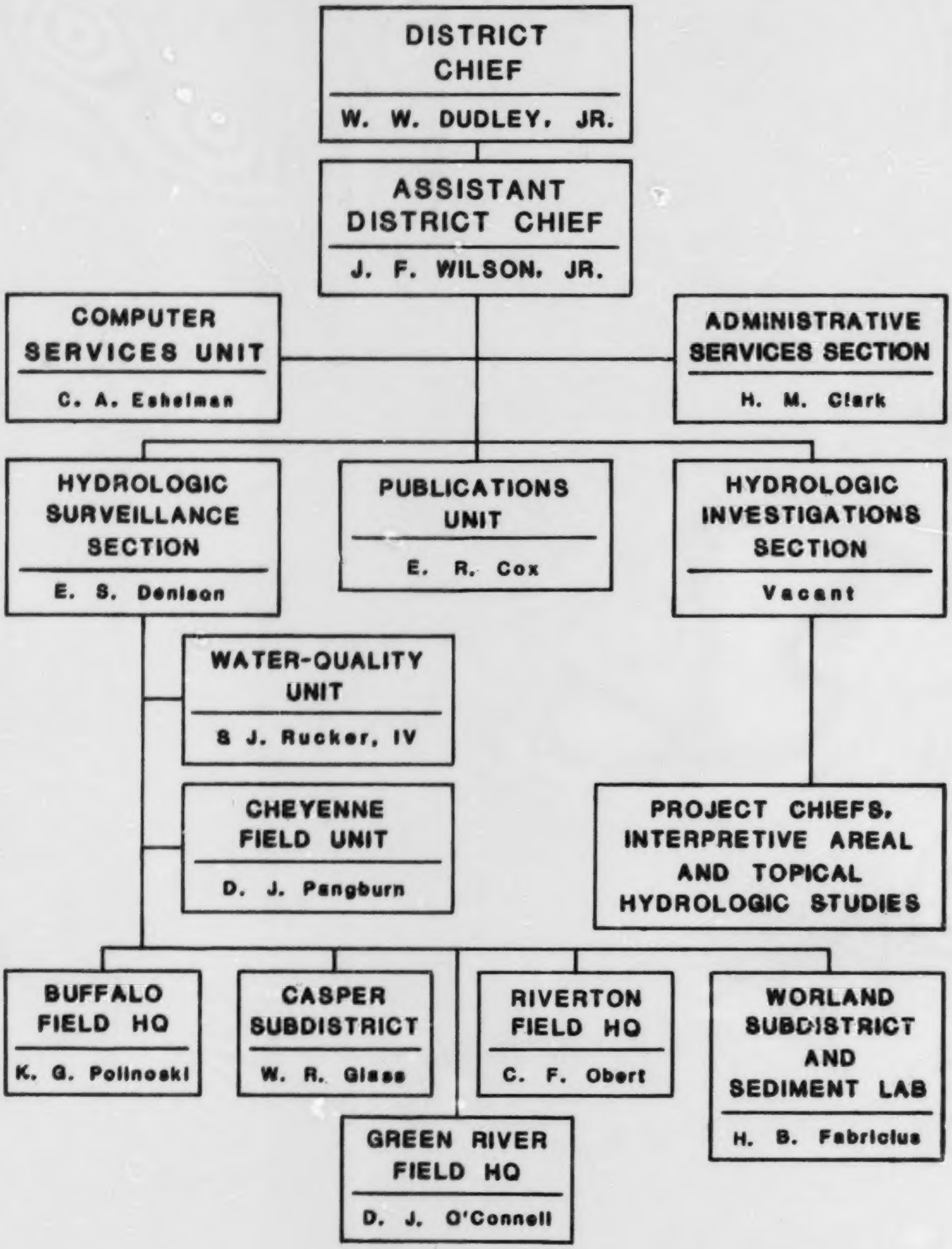

DISTRICT CHIEF
W. W. DUDLEY, JR.
ASSISTANT DISTRICT CHIEF
J. F. WILSON, JR.
COMPUTER SERVICES UNIT
C. A. Eshelman
ADMINISTRATIVE SERVICES SECTION
H. M. Clark
HYDROLOGIC SURVEILLANCE SECTION
E. S. Denison
PUBLICATIONS UNIT
E. R. Cox
HYDROLOGIC INVESTIGATIONS SECTION
Vacant
WATER-QUALITY UNIT
S J. Rucker, IV
CHEYENNE FIELD UNIT
D. J. Pangburn
PROJECT CHIEFS, INTERPRETIVE AREAL AND TOPICAL HYDROLOGIC STUDIES
BUFFALO FIELD HQ
K. G. Polinoski
CASPER SUBDISTRICT
W. R. Glass
RIVERTON FIELD HQ
C. F. Obert
WORLAND SUBDISTRICT AND SEDIMENT LAB
H. B. Fabricius
GREEN RIVER FIELD HQ
D. J. O'Connell

Figure 2.

WHERE TO OBTAIN GEOLOGICAL SURVEY PUBLICATIONS

Current releases are described in a monthly pamphlet, "New Publications of the Geological Survey," which may be obtained from

Branch of Distribution
U.S. Geological Survey
604 South Pickett Street
Alexandria, VA 22304

Professional Papers, Bulletins, Water Supply Papers, Techniques of Water Resources Investigations, Earthquake Information Bulletin, and popular leaflets, pamphlets, and booklets may be purchased from the above address. Additional information is given in "A Guide to Obtaining Information from the U.S. Geological Survey, 1979," Geological Survey Circular 777, available without cost from the above address.

Open-file reports from Wyoming are available for inspection at the Wyoming District Office.

Flood-prone area maps may be obtained from the Wyoming District Office.

Map information is available from

Branch of Distribution
U.S. Geological Survey
Box 25286, Federal Center
Lakewood, CO 80225

Requests for miscellaneous water information and information on programs in other States may be referred to

Water Resources Division
U.S. Geological Survey, Mail Stop 440
12201 Sunrise Valley Drive
Reston, VA 22092

The Geological Survey National Center maintains a library with an extensive earth-sciences collection. Local libraries may obtain books, periodicals, and maps through interlibrary loan by writing to

U.S. Geological Survey Library
12201 Sunrise Valley Drive
Reston, VA 22092

DATA-COLLECTION SITES

Lists of the data-collection sites and the kinds of hydrologic data being collected at each are given as follows: Table 1, streamflow and reservoir stations; table 2, ground-water stations; table 3, water-quality stations; table 4, sediment stations; and table 5, peak-flow partial-record stations.

Identification numbers have been assigned to conform with the standard downstream order for listing stations within each hydrologic region. The location of each data site is given in the tables. In table 2, ground-water stations are listed in numerical order by counties.

Abbreviations and codes are used to conserve space in the tables. Explanations of the abbreviations and codes precede each table.

The locations of surface-water data sites are shown in figures 3-7. The locations of ground-water stations are shown in figures 8-11.

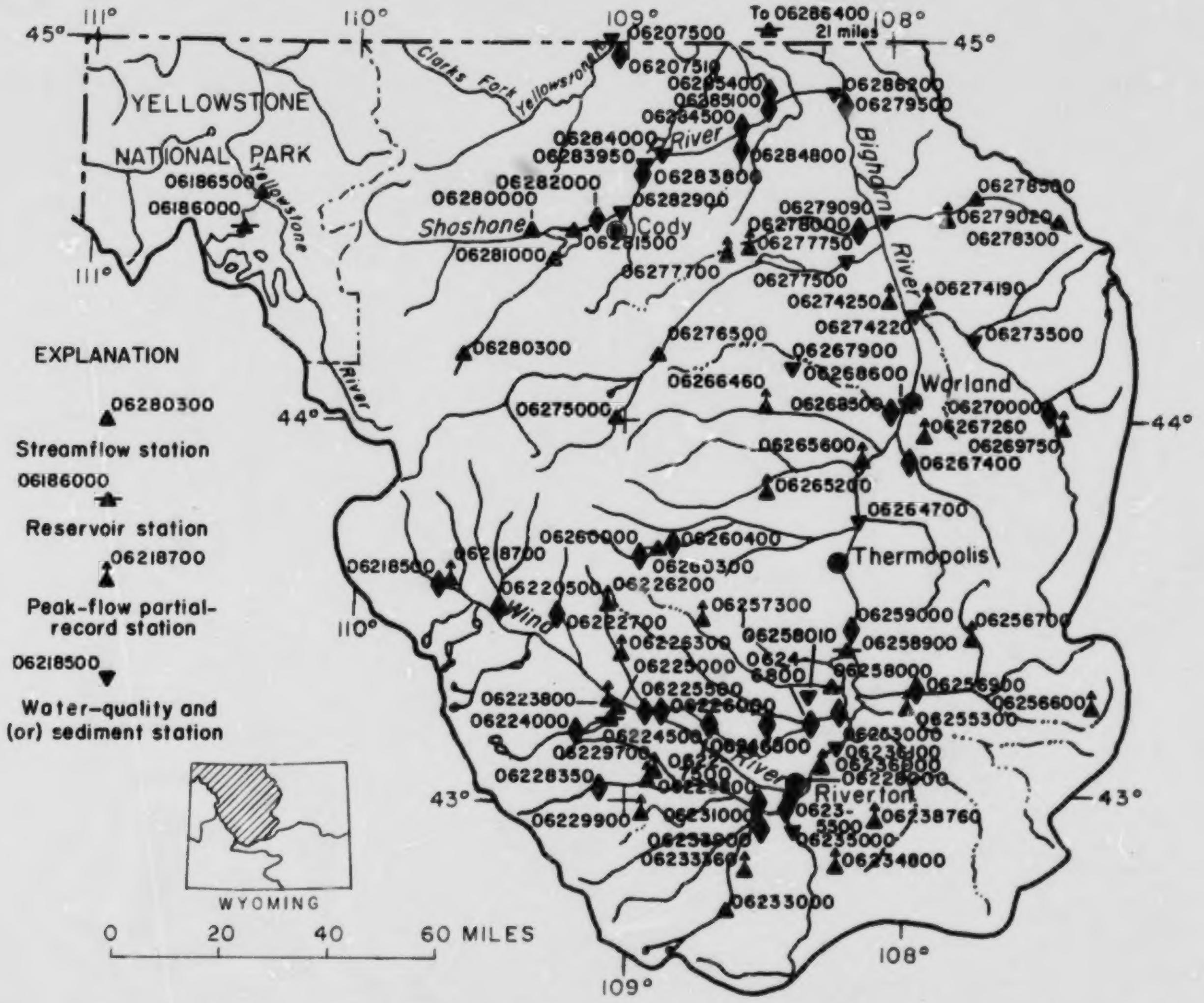

45°
111°
110°
109°
108°
45°
To 06286400
21 miles
YELLOWSTONE
NATIONAL PARK
Yellowstone
Clarks Fork Yellowstone
River
Shoshone
Cody
Bighorn
River
Worland
Thermopolis
Wind
River
Riverton
44°
43°
EXPLANATION
06280300
Streamflow station
06186000
Reservoir station
06218700
Peak-flow partial-record station
06218500
Water-quality and (or) sediment station
WYOMING
0
20
40
60 MILES
06207500
06207510
06285400
06285100
06284500
06284000
06283950
06284800
06283800
06282000
06282900
06280000
06281500
06281000
06277700
06186500
06186000
06286200
06279500
06279090
06278000
06277750
06277500
06278500
06279020
06278300
06274250
06274190
06274220
06273500
06280300
06276500
06267900
06268600
06266460
06275000
06268500
06270000
06267260
06269750
06265600
06267400
06265200
06264700
06260000
06260400
06260300
06218500
06218700
06220500
06226200
06257300
06222700
06259000
06256700
06226300
06258010
06258900
06225000
06246800
06258000
06256900
06223800
06225500
06226000
06256600
06255300
06224000
06224500
06236000
06229700
06227500
06235100
06235600
06228000
06228350
06229900
06231000
06235500
06238760
06233900
06235000
06233360
06234800
06233000
108°
109°

Figure 3.—Location of surface-water data sites in the Yellowstone River, Clarks Fork Yellowstone River, and Bighorn River basins.

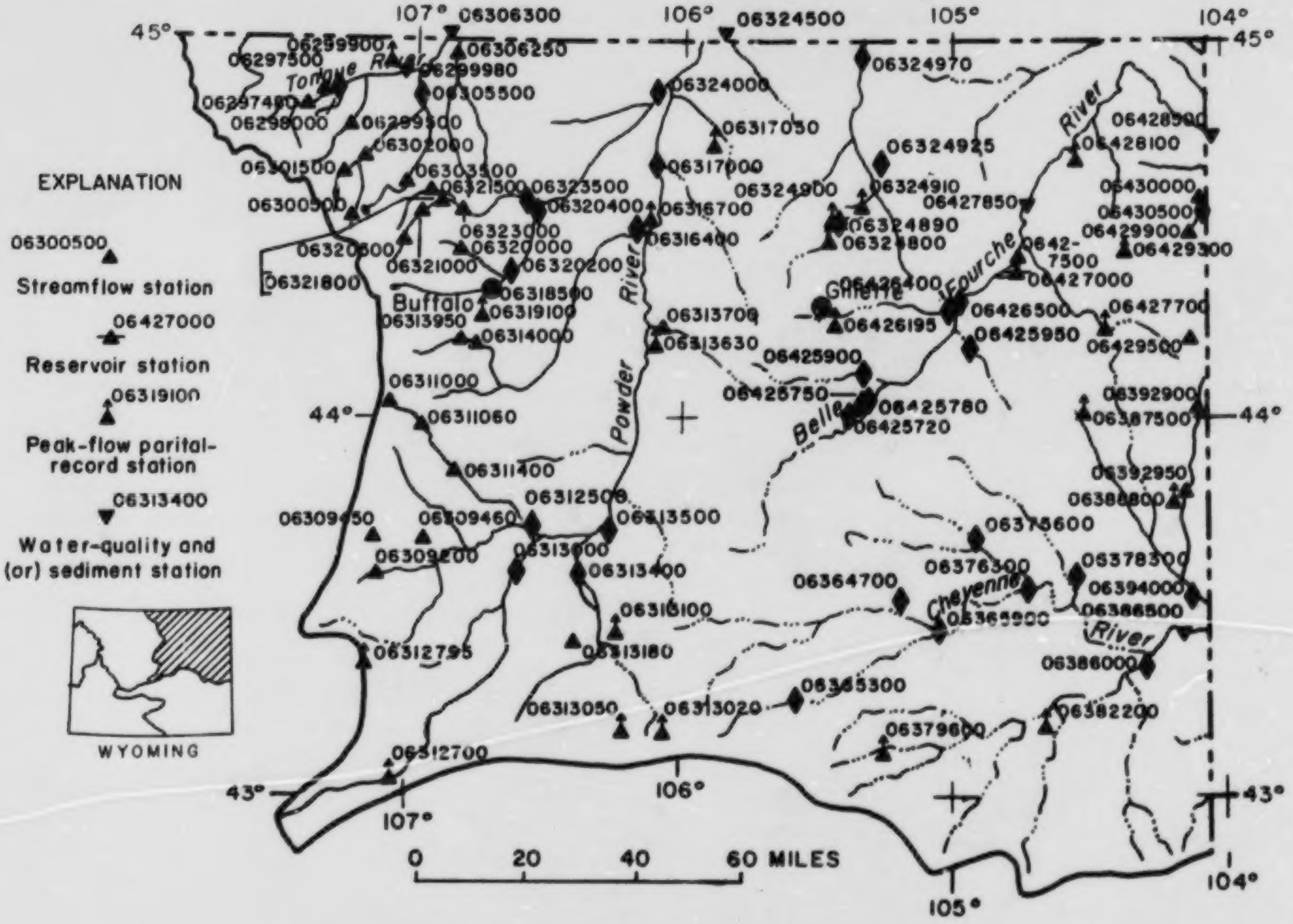

45°
107°
06306300
106°
06324500
105°
104°
45°
06299900
06297500
Tongue River
06306250
06299980
06305500
06297480
06298000
06299300
06302000
06301500
06303500
06321500
06323500
06300500
06320400
06323000
06320000
06320600
06321000
06320200
06321800
Buffalo
06318500
06319100
06313950
06314000
06311000
44°
06311060
06311400
06309450
06309460
06312500
06313500
06309200
06313000
06313400
06316100
06313180
06312795
06313050
06313020
06312700
43°
107°
106°
06324000
06317050
06317000
06316700
06316400
Powder River
06313700
06313630
06324970
06324925
06324900
06324910
06324890
06324800
Gillette
06426400
06426195
06425900
06425750
06425780
06425720
Belle Fourche River
06426500
06425950
06427850
06427500
06427000
06428500
06428100
06430000
06430500
06429900
06429300
06427700
06429500
06392900
06387500
44°
06392950
06388800
06375600
06376300
06378300
06394000
06386500
06364700
Cheyenne River
06365900
06386000
06365300
06379600
06382200
43°
105°
104°
0
20
40
60 MILES
EXPLANATION
06300500
Streamflow station
06427000
Reservoir station
06319100
Peak-flow parital-record station
06313400
Water-quality and (or) sediment station
WYOMING

Figure 4.—Location of surface-water data sites in the Tongue River, Powder River, Belle Fourche River, and Cheyenne River basins.

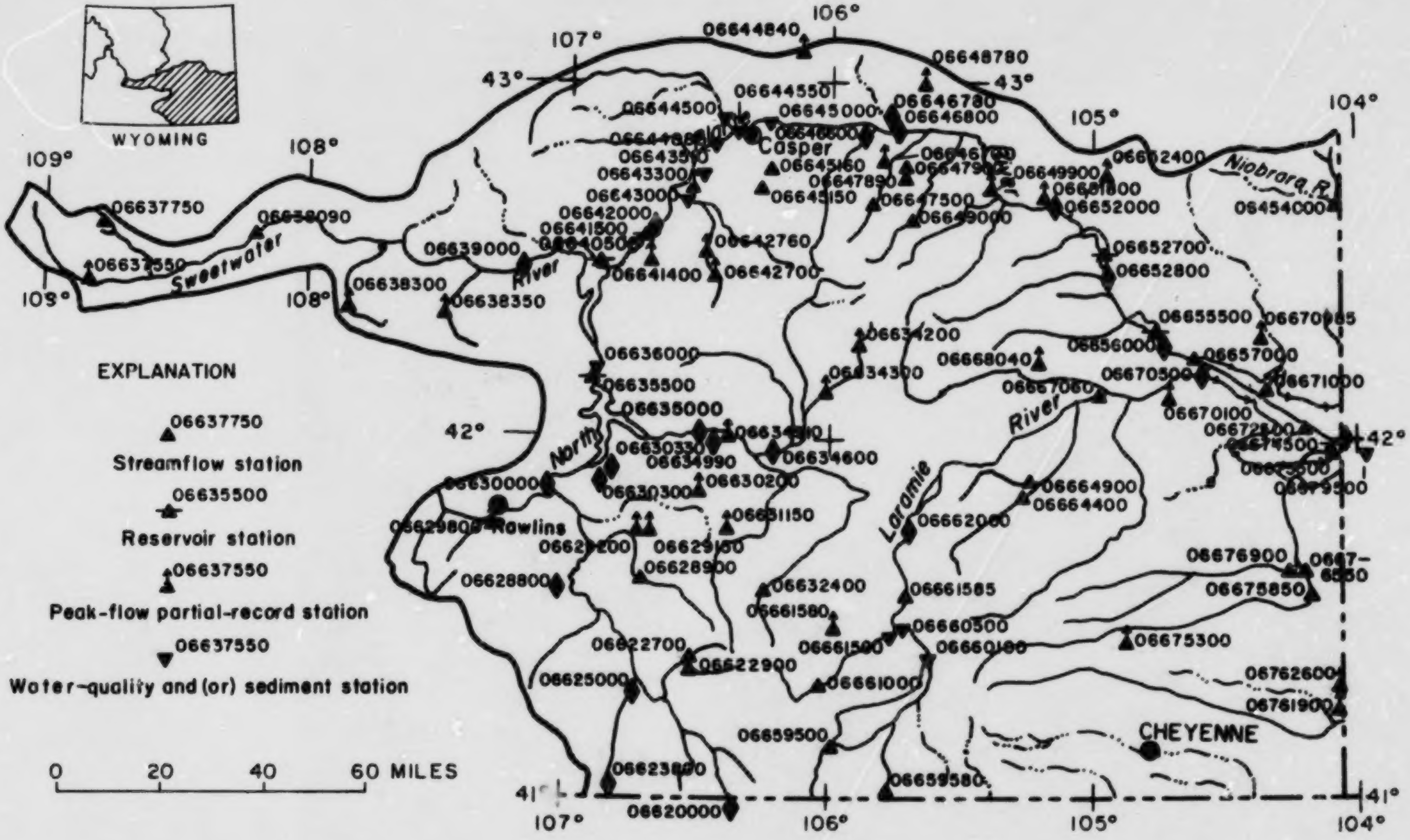
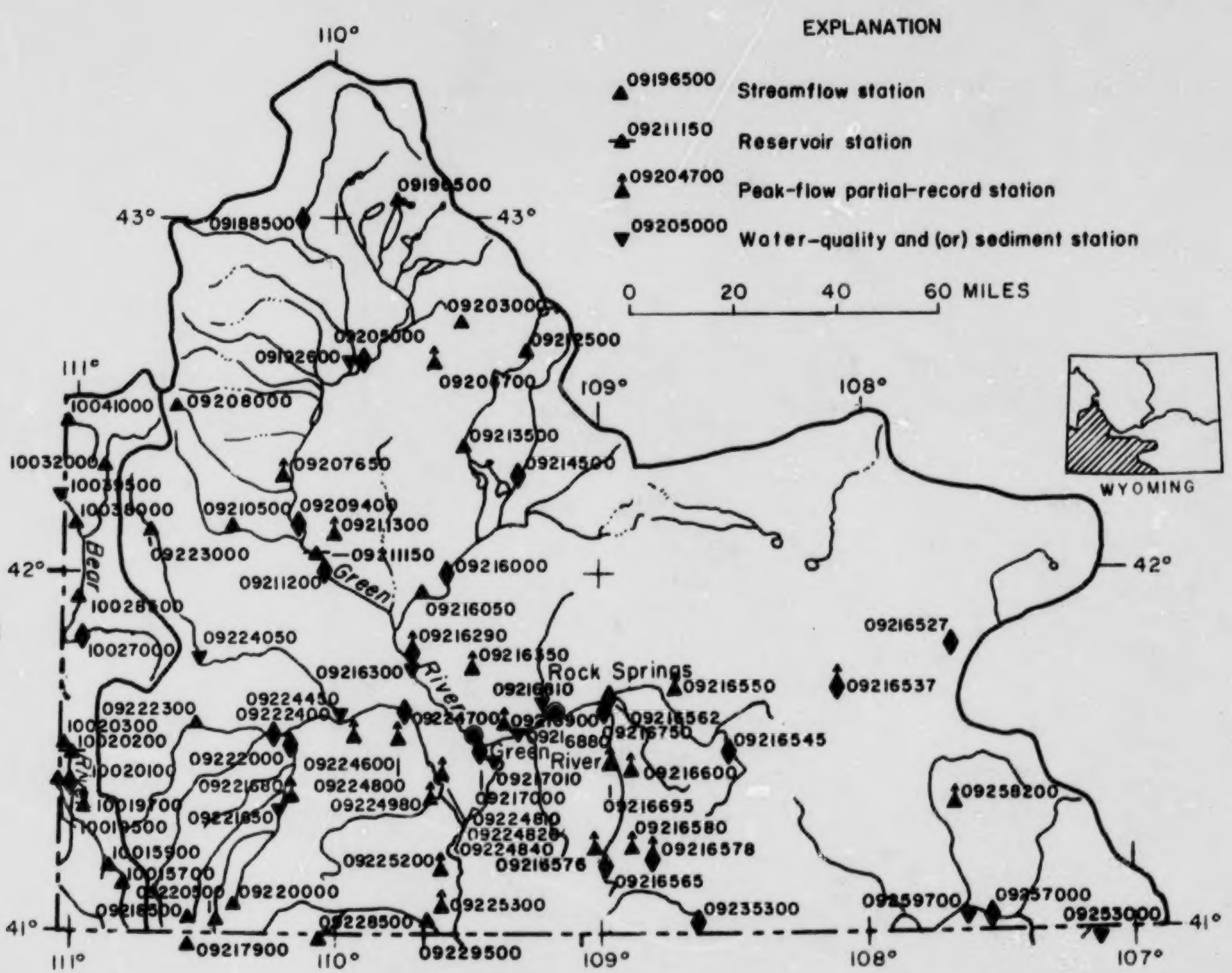

WYOMING
109°
108°
107°
106°
105°
104°
43°
42°
41°
Sweetwater
River
North
Laramie
River
Niobrara R.
Casper
Rawlins
CHEYENNE
06644840
06648780
06644550
06645000
06646780
06646800
06644500
06644800
06646600
06643500
06645160
06645150
06643300
06643000
06642000
06641500
06640500
06641400
06642760
06642700
06637750
06638090
06637550
06639000
06638300
06638350
06646700
06647890
06647900
06647500
06649000
06649900
06651800
06652000
06652400
06454000
06652700
06652800
06655500
06670985
06656000
06657000
06668040
06634200
06634300
06667060
06670500
06671000
06670100
06672000
06674500
06673500
06679500
06636000
06635500
06635000
06634510
06630330
06634990
06634600
06630000
06630300
06630200
06631150
06629800
06629200
06629150
06628900
06664900
06664400
06662000
06676900
0667-6550
06675850
06628800
06632400
06661580
06661585
06660500
06661500
06660100
06675300
06622700
06622900
06625000
06661000
06762600
06761900
06659500
06623800
06659580
06620000
EXPLANATION
06637750
Streamflow station
06635500
Reservoir station
06637550
Peak-flow partial-record station
06637550
Water-quality and (or) sediment station
0
20
40
60 MILES

Figure 5.—Location of surface-water data sites in the Niobrara River and Platte River basins.


EXPLANATION
09196500 Streamflow station
09211150 Reservoir station
09204700 Peak-flow partial-record station
09205000 Water-quality and (or) sediment station
0 20 40 60 MILES
WYOMING
110°
43°
111°
109°
108°
107°
42°
41°
Bear
Green
River
Rock Springs
Green River
09188500
09196500
09203000
09212500
09205000
09192600
09204700
09208000
10041000
09213500
09207650
09214500
10032000
10039500
10038000
09210500
09209400
09211300
09211150
09223000
09211200
09216000
10028500
09216050
09216290
10027000
09224050
09216350
09216527
09216300
09216810
09216550
09216537
09222300
09224450
09224700
09216900
09216562
09222400
10020300
10020200
09216880
09216750
09216545
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10020100
09224600
09216600
09221680
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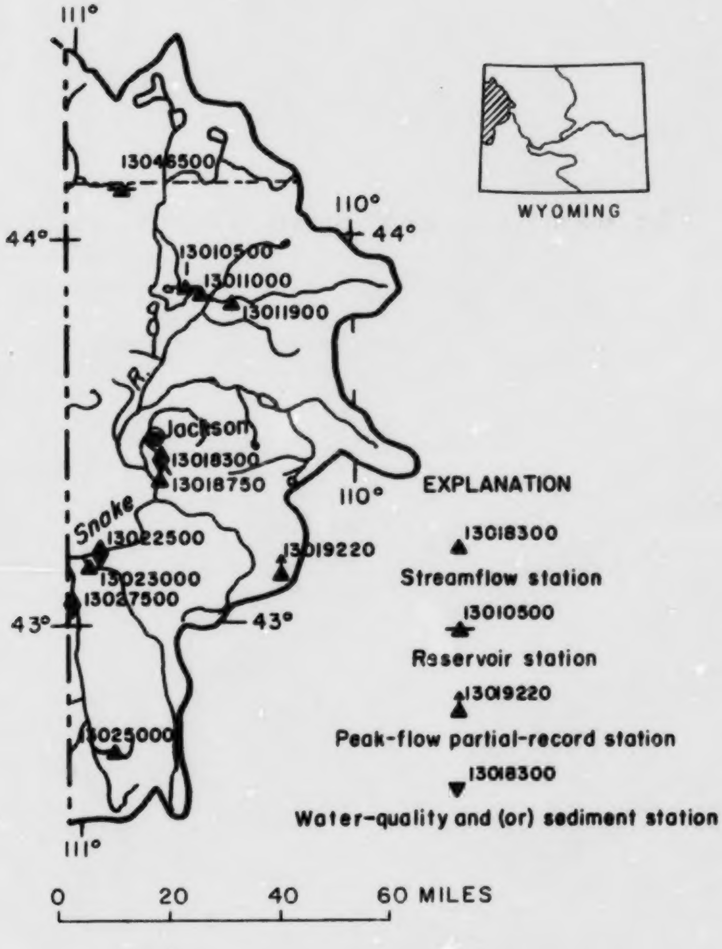
09217010
10019700
09221650
09224980
09217000
09216695
09258200
10019500
09224810
09216580
10015900
09224820
09216578
09224840
10015700
09225200
09216576
09216565
09220500
09220000
09225300
09235300
09259700
09257000
09218500
09253000
09228500
09217900
09229500

Figure 6.—Location of surface-water data sites in the Green River and Bear River basins.



111°
13046500
110°
44°
44°
13010500
13011000
13011900
R.
Jackson
13018300
13018750
110°
Snake
13022500
13019220
13023000
13027500
43°
43°
13025000
111°
WYOMING
EXPLANATION
▲ 13018300
Streamflow station
13010500
Reservoir station
▲ 13019220
Peak-flow partial-record station
▼ 13018300
Water-quality and (or) sediment station
0
20
40
60 MILES

Figure 7.—Location of surface-water data sites in the Snake River basin.

Streamflow and reservoir stations

Explanation of abbreviations and codes used in table 1.

Purpose: B, bench-mark or long-term-trend station
C, current-purpose station such as accounting, operation, forecasting, disposal, water quality, compact or legal, research or special study
H, hydrologic station
P, principal-stream station
R, regulated station

Period of Record: The dates given are the calendar years in which records began or ended. Breaks of less than a year are not shown.

Location: SE, section
TSP, township
RNGE, range

Gage Equipment: D, digital recorder
G, graphic recorder
M, manometer gage
O, observer record only
S, staff gage
T, pressure-transducer gage
W, well gage

Current Record Type: S, seasonal operation (no winter records)
Y, full-year operation

Field Office: B, Buffalo
C, Casper
CF, Cheyenne Field Unit
CO, Colorado District
CT, Contractor
GR, Green River
I, Idaho District
M, Montana District
N, Nebraska District
R, Riverton
S, Wyoming State Engineer
SD, South Dakota District
W, Worland
U, Utah District

Funding Agency: BIA, Bureau of Indian Affairs
BLM, Bureau of Land Management
CE, Corps of Engineers
DEPD, Wyoming Department of Economic Planning and Development
MRB, Geological Survey, Missouri River Basin Program
USE, Utah State Engineer
USGS, Geological Survey, Federal Program
WDEQ, Wyoming Department of Environmental Quality
WGF, Wyoming Game and Fish Department
WPUC, Water and Power Resources Service, Upper Colorado Region
WPUM, Water and Power Resources Service, Upper Missouri Region
WSE, Wyoming State Engineer

Remarks: WPRS, Water and Power Resources Service

Table 1. Streamflow and reservoir stations

STATION NUMBER	STATION NAME	PURPOSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
					SE	TSP	RNGE					
YELLOWSTONE RIVER BASIN												
06186000	YELLOWSTONE LAKE AT BRIDGE BAY, YNP	P	1006	1921-	-	-	-	D	Y	M	-	
06186500	YELLOWSTONE R AT YELLOWSTONE LAKE OUTLET, YNP	P	1006	1922-25, 1926-	-	-	-	GW	Y	M	-	
*#06207510	BIG SAND COULEE AT WYOMING-MONTANA STATE LINE	CR	134	1973-	32	9S	22E	GM	S	M	BLM	
*06218500	WIND RIVER NEAR DUBOIS	C	232	1945-	25	42N	108W	DW	Y	R	WSE	
*#06220500	EAST FORK WIND RIVER NEAR DUBOIS	C	427	1950-57, 1975-	34	6N	6W	GM	Y	R	MRB	
*06222700	CROW CREEK NEAR TIPPERARY	H	30.2	1962-	20	7N	4W	GM	Y	R	MRB	
*06224000	BULL LAKE CREEK ABOVE BULL LAKE	H	187	1941-53, 1966-	2	2N	4W	DW	Y	R	MRB	
06224500	BULL LAKE NEAR LENORE	C	210	1938-	30	3N	2W	-	-	-	MRB, WPUM	FURNISHED BY WPRS
06225000	BULL LAKE CREEK NEAR LENORE	C	213	1918-	17	3N	2W	DGM	Y	R	WPUM	
#06225500	WIND RIVER NEAR CROWHEART	CP	1891	1945-	16	3N	2W	DGM	Y	R	WPUM	
#06226000	WYOMING CANAL NEAR LENORE	CR	-	1941-45, 1949-	17	3N	1W	DW	S	R	WPUM	APR THRU OCT
*06228000	WIND RIVER AT RIVERTON	CR	2309	1906-08, 1911-	2	1S	4E	DGM	Y	R	CE	
*06228350	SF LITTLE WIND R AB WASHAKIE RE NR FT WASHAKIE	H	90.3	1976-	18	1S	2W	DW	Y	R	MRB	
*06231000	LITTLE WIND RIVER ABOVE ARAPAHOE	C	660	1979-	23	1S	3E	DM	Y	R	BIA	
06233000	LITTLE POPO AGIE RIVER NEAR LANDER	C	125	1946-	27	32N	99W	GW	S	S	WSE	
*06233900	POPO AGIE RIVER NEAR ARAPAHOE	C	-	1979-	27	1S	3E	DM	Y	R	BIA	
*06235500	LITTLE WIND RIVER NEAR RIVERTON	CR	1904	1941-	11	1S	4E	DW	Y	R	CE	
*06246500	OCEAN DRAIN AT OCEAN LAKE OUTLET, NR PAVILLION	C		1948-53, 1978-				DW	Y	R	MRB	
#06246800	OCEAN DRAIN NEAR MIDVALE	C	-	1979-	25	3N	3E	DW	Y	R	WPUM	
*#06253000	FIVEMILE CREEK NEAR SHOSHONI	C	418	1941-42, 1948-	19	3N	6E	GM	Y	R	WPUM	
*#06256900	DRY CREEK NEAR BONNEVILLE	CH	52.6	1965-	8	38N	92W	GW	Y	R	BLM	
06258000	MUDDY CREEK NEAR SHOSHONI	C	332	1949-68, 1972-	34	4N	5E	GM	Y	R	WPUM	
06258900	BOYSEN RESERVOIR	C	7700	1951-	16	5N	6E	-	-	-	MRB	FURNISHED BY WPRS
*#06259000	WIND RIVER BELOW BOYSEN RESERVOIR	CR	7701	1951-	9	5N	6E	DM	Y	R	WPUM	
*06260000	SOUTH FORK OWL CREEK NEAR ANCHOR	CH	85.5	1932, 1939-43, 1959-	28	43N	100W	GM	Y	W	MRB	
06260300	ANCHOR RESERVOIR	C	131	1960-	26	43N	100W	-	-	-	MRB	FURNISHED BY WPRS
*06260400	SOUTH FORK OWL CREEK BELOW ANCHOR RESERVOIR	CR	131	1959-	25	43N	100W	GW	Y	W	MRB	
*#06267400	EAST FORK NOWATER CREEK NEAR COLTER	H	149	1971-	31	46N	92W	GM	Y	W	WSE	
*#06268500	FIFTEENMILE CREEK NEAR WORLAND	C	518	1951-72, 1978-	27	47N	93W	GM	Y	W	BLM	
*#06270000	NOWOOD RIVER NEAR TEN SLEEP	P	803	1938-43, 1950-55, 1972-	27	47N	88W	DGM	Y	W	WSE	
06275000	WOOD RIVER AT SUNSHINE	CH	194	1945-	15	47N	101W	GM	Y	W	WSE	
06276500	GREYBULL RIVER AT MEETEETSE	CP	681	1897, 1903, 1920-	4	48N	100W	DGM	S	S	WSE	
*06278000	DRY CREEK NEAR GREYBULL	C		1951-53, 1955-60, 1979-	7	52N	94W		Y	W	BLM	

* Also water-quality station.
# Also sediment station.

Table 1. Streamflow and reservoir stations (continued)

STATION NUMBER	STATION NAME	PURPOSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
					SE	TSP	RNGE					
YELLOWSTONE RIVER BASIN (continued)												
06278300	SHELL CREEK ABOVE SHELL RESERVOIR	BCH	23.1	1956-	1	52N	88W	DW	Y	W	WSE	
06278500	SHELL CREEK NEAR SHELL	CH	145	1940-	17	53N	90W	GW	S	S	WSE	
*#06279500	BIGHORN RIVER AT KANE	CR	15765	1928-	9	55N	94W	GW	Y	W	MRB	
06280000	NORTH FORK SHOSHONE RIVER NEAR WAPITI	CH		1921-26, 1979-	15	52N	104W	GM	Y	W	WGF	
06280300	SOUTH FORK SHOSHONE RIVER NEAR VALLEY	BH	297	1956-	24	49N	106W	DW	Y	W	USGS	
06281000	SOUTH FORK SHOSHONE RIVER ABOVE BUFFALO BILL RES	P	585	1903, 1905-08, 1921-26, 1973-	33	52N	103W	GM	Y	W	WSE	
06281500	BUFFALO BILL RESERVOIR	C	1498	1909-	12	52N	103W	-	-	-	MRB	FURNISHED BY WPRS
*06282000	SHOSHONE RIVER BELOW BUFFALO BILL RESERVOIR	CR	1538	1921-	3	52N	102W	DW	Y	W	WPUM	
#06283800	SHOSHONE RIVER ABOVE WILLWOOD DAM, NR WILLWOOD	CR	-	1979-	19	54N	100W	GM	Y	W	WPUM	
*06284500	BITTER CREEK NEAR GARLAND	C	80.5	1950-53, 1957-60, 1968-	7	55N	97W	DW	Y	W	MRB	
*06284800	WHISTLE CREEK NEAR GARLAND	C	101	1958-60, 1968-	30	55N	97W	GM	Y	W	MRB	
*#06285100	SHOSHONE RIVER NEAR LOVELL	CR	2350	1966-	16	56N	96W	GM	Y	W	MRB	
*06285400	SAGE CREEK AT SIDON CANAL, NEAR DEAVER	C	341	1958-60, 1968-	34	57N	97W	GM	Y	W	MRB	
06286400	BIGHORN LAKE NEAR ST. XAVIER, MT	C	19626	1965-	18	6S	31E	-	-	-	MRB	FURNISHED BY WPRS
06297500	HIGHLINE DITCH NEAR DAYTON	C	-	1919-23, 1940-	11	56N	87W	GW	S	B	WSE	
*06298000	TONGUE RIVER NEAR DAYTON	BCH	204	1918-29, 1940-	11	56N	87W	DW	Y	B	WSE	
06299500	WOLF CREEK AT WOLF	CH	37.8	1945-	4	55N	86W	GW	S	S	WSE	
06300500	EAST FORK BIG GOOSE CREEK NEAR BIG HORN	CH	20.1	1953-	28	53N	86W	GM	S	S	WSE	
06301500	WEST FORK BIG GOOSE CREEK NEAR BIG HURN	C	24.4	1953-	30	54N	86W	GM	S	S	WSE	
06302000	BIG GOOSE CREEK NEAR SHERIDAN	C	120	1929-	35	55N	86W	GW	S	S	WSE	
06303500	LITTLE GOOSE CREEK IN CANYON, NEAR BIG HORN	CH	51.6	1941-	1	53N	85W	GW	S	S	WSE	
*#06305500	GOOSE CREEK BELOW SHERIDAN	C	392	1941-	15	56N	84W	DW	Y	B	WSE	
06306250	PRAIRIE DOG CREEK NEAR ACME	C	358	1970-	23	58N	83W	GW	Y	W	-	
06309200	MIDDLE FORK POWDER RIVER NEAR BARNUM	H	45.2	1961-	26	42N	86W	GM	Y	C	WSE	
06309450	BEAVER CREEK BELOW BAYER CREEK, NEAR BARNUM	C	10.9	1974-	28	43N	85W	GW	Y	C	USGS	
06309460	BEAVER CREEK AB WHITE PANTHER DITCH, NEAR BARNUM	C	24.2	1974-	16	43N	84W	GW	Y	C	USGS	
06311000	NORTH FORK POWDER RIVER NEAR HAZELTON	BCH	24.5	1946-	21	47N	85W	GW	Y	B	WSE	
06311060	N FORK POWDER RIVER BL BULL CREEK, NR HAZELTON	C	32.3	1974-	25	47N	85W	GM	Y	B	USGS	
06311400	N FORK POWDER RIVER BL PASS CREEK, NR MAYOWORTH	CH	100	1974-	36	46N	84W	GM	Y	B	WSE	
*06312500	POWDER RIVER NEAR KAYCEE	C	980	1933-35, 1938-71, 1978-	13	43N	81W	GW	Y	C	WDEQ	
*06313000	SOUTH FORK POWDER RIVER NEAR KAYCEE	C	1150	1911, 1938-40, 1950-69, 1978-	9	42N	81W	GM	Y	C	WDEQ	
06313180	DUGOUT CREEK TRIBUTARY NEAR MIDWEST	H	.8	1974-	14	40N	80W	GW	Y	C	USGS	
*#06313400	SALT CREEK NEAR SUSSEX	C	769	1976-	8	42N	79W	GM	Y	C	USGS	
*#06313500	POWDER RIVER AT SUSSEX	CP	3090	1938-40, 1950-57, 1977-	13	43N	79W	DGM	Y	CT	USGS	

* Also water-quality station.
# Also sediment station.

Table 1. Streamflow and reservoir stations (continued)

STATION NUMBER	STATION NAME	PURPOSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
YELLOWSTONE RIVER BASIN (continued)												
06313700	DEAD HORSE CREEK NEAR BUFFALO	H	151	1971-	15	49N	77W	GM	Y	B	WSE	
06313950	N F CRAZY WOMAN CREEK BL POLE CREEK, NR BUFFALO	CH	43.4	1973-	28	49N	83W	GM	Y	B	DEPD	
06314000	NORTH FORK CRAZY WOMAN CREEK NEAR BUFFALO	CH	44.9	1942-49, 1973-	27	49N	83W	GM	Y	B	DEPD	AUXILIARY WELL GAGE
*#06316400	CRAZY WOMAN CREEK AT UPPER STATION,NEAR ARVADA	CP	945	1963-70, 1977-	18	52N	77W	DGW	Y	CT	USGS	
*06317000	POWDER RIVER AT ARVADA	CP	6050	1919-	21	54N	77W	GM	Y	B	WSE	
06318500	CLEAR CREEK NEAR BUFFALO	C	120	1894, 1896-99, 1917-27, 1938-	6	50N	82W	GW	Y	B	DEPD	
06320000	ROCK CREEK NEAR BUFFALO	CR	60.0	1941-	29	52N	83W	GW	S	S	WSE	
*#06320200	CLEAR CREEK BELOW ROCK CREEK, NEAR BUFFALO	C	322	1975-	30	51N	81W	GW	Y	B	USGS	
*#06320400	CLEAR CREEK AT UCROSS	C	409	1976-	19	53N	80W	GM	Y	B	USGS	
06320500	SOUTH PINEY CREEK AT WILLOW PARK	CR	33.6	1945-57, 1959-	24	52N	85W	GW	S	S	WSE	
06321000	SOUTH PINEY CREEK NEAR STORY	C	69.4	1951-71, 1974-	23	53N	84W	GM	Y	B	WSE	
06321500	NORTH PINEY CREEK NEAR STORY	CH	36.8	1951-	12	53N	84W	DW	Y	B	DEPD	
06323000	PINEY CREEK AT KEARNY	CR	118	1902-06, 1910-17, 1919-23, 1940-	26	53N	83W	GW	Y	S	WSE	
*06323500	PINEY CREEK AT UCROSS	CR	267	1917-23, 1950-	18	53N	80W	GW	Y	B	DEPD	
*#06324000	CLEAR CREEK NEAR ARVADA	C	1110	1915-19, 1928-29, 1939-	36	57N	77W	DW	Y	B	DEPD	
*#06324500	POWDER RIVER AT MOORHEAD, MT	-	8080	1929-72, 1974-	8	9N	48W	GW	Y	B	-	
*#06324890	LITTLE POWDER R BELOW CORRAL C NEAR WESTON	CP	204	1977-	12	52N	72W	DGM	Y	CT	USGS	
*#06324925	LITTLE POWDER RIVER NEAR WESTON	CP	540	1977-	19	54N	70W	DGM	Y	CT	USGS	
*#06324970	LITTLE POWDER RIVER ABOVE DRY CREEK, NEAR WESTON	P	1235	1972-	13	57N	71W	DGM	Y	CT	WSE	
CHEYENNE RIVER BASIN												
*#06364700	ANTELOPE CREEK NEAR TECKLA	CP	959	1977-	35	41N	70W	DGM	Y	CT	USGS	
*#06365300	DRY FORK CHEYENNE RIVER NEAR BILL	C	128	1976-	31	38N	73W	GM	Y	C	BLM	
*#06365900	CHEYENNE RIVER NEAR DULL CENTER	C	1527	1976-	20	40N	68W	DGM	Y	CT	USGS	
*#06375600	LITTLE THUNDER CREEK NEAR HAMPSHIRE	CP	234	1977-	33	43N	67W	DGM	Y	CT	USGS	
*#06376300	BLACK THUNDER CREEK NEAR HAMPSHIRE	H	535	1972-	31	42N	65W	DGM	Y	CT	WSE	
*#06378300	LODGEPOLE CREEK NEAR HAMPSHIRE	CP	354	1977-	5	41N	64W	DGM	Y	CT	USGS	
*#06386000	LANCE CREEK NEAR RIVERVIEW	P	2070	1948-54, 1956-	14	39N	62W	GMW	Y	C	USGS	
06392900	BEAVER CREEK AT MALLO CAMP, NEAR FOUR CORNERS	C	10.3	1974-	4	47N	60W	GM	Y	SD	USGS	
06392950	STOCKADE BEAVER CREEK NEAR NEWCASTLE	C	107	1974-	19	45N	60W	GM	Y	SD	USGS	
*06394000	BEAVER CREEK NEAR NEWCASTLE	BP	1320	1943-	18	41N	60W	DGW	Y	C	USGS	
*#06425720	BELLE FOURCHE RIVER BEL RATTLESNAKE CR, NR PINEY	C	495	1975-	9	46N	71W	GM	Y	B	USGS	
*#06425750	COAL CREEK NEAR PINEY	C	-	1980-	12	46N	71W	DGM	Y	B	USGS	ESTAB. 09/80
*#06425780	BELLE FOURCHE RIVER ABOVE DRY CREEK, NEAR PINEY	C	594	1975-	25	47N	71W	GM	Y	B	USGS	
*#06425900	CABALLO CREEK AT MOUTH, NEAR PINEY	CR	260	1977-	4	47N	70W	DGM	Y	CT	USGS	
*#06425950	RAVEN CREEK NEAR MOORCROFT	CH	76	1977-	1	48N	69W	DGM	Y	CT	USGS	
*#06426400	DONKEY CREEK NEAR MOORCROFT	CR	246	1977-	30	50N	68W	DGM	Y	CT	USGS	

* Also water-quality station.

# Also sediment station.

Table 1. Streamflow and reservoir stations (continued)

STATION NUMBER	STATION NAME	PURPOSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
CHEYENNE RIVER BASIN (continued)												
*#06426500	BELLE FOURCHE RIVER BELOW MOORCROFT	C	1670	1943-70 1975-	24	50N	68W	GW	Y	C	BLM	
06427000	KEYHOLE RESERVOIR NEAR MOORCROFT	C	2000	1952-	27	51N	66W	-	-	-	MRB	FURNISHED BY WPRS
06427500	BELLE FOURCHE RIVER BELOW KEYHOLE RESERVOIR	CR	2000	1951-	21	51N	66W	GW	Y	C	WPUM	
06429500	COLD SPRINGS CREEK AT BUCKHORN	C	19.0	1974-	9	48N	60W	GW	Y	SD	USGS	
06429905	SAND CREEK NEAR RANCH A, NEAR BEULAH	C	267	1976-	5	52N	60W	GW	Y	SD	USGS	
06430000	MURRAY DITCH AT WYOMING-SOUTH DAKOTA STATE LINE	C	-	1954-	7	7N	1E	GW	Y	SD	WSE	
#06430500	REDWATER CR AT WYOMING-SOUTH DAKOTA STATE LINE	CH	471	1929-31, 1936-37, 1954-	18	7N	1E	GW	Y	SD	WSE	
NIOBRARA RIVER BASIN												
06454000	NIOBRARA RIVER AT WYOMING-NEBRASKA STATE LINE	BCH	450	1955-	15	31N	60W	DW	Y	N	-	
PLATTE RIVER BASIN												
*06620000	NORTH PLATTE RIVER AT NORTHGATE, CO	H	1431	1904, 1915-	11	11N	80W	DW	Y	CF	USGS	
06622700	NORTH BRUSH CREEK NEAR SARATOGA	H	37.4	1960-	8	16N	81W	GW	Y	CF	WSE	
06622900	SOUTH BRUSH CREEK NEAR SARATOGA	C	22.8	1960-74, 1976-	20	16N	81W	GW	S	S	WSE	
*#06623800	ENCAMPMENT R AB HOG PARK CREEK, NEAR ENCAMPMENT	BH	72.7	1964-	10	12N	84W	GW	Y	CF	USGS	HYDRO BENCHMARK STA
*06625000	ENCAMPMENT RIVER AT MOUTH, NEAR ENCAMPMENT	CH	265	1940-	3	15N	83W	DW	Y	CF	WSE	
*#06628800	SAGE CREEK NEAR SARATOGA	C	263	1973-	32	19N	85W	GW	S	CF	BLM	
06628900	PASS CREEK NEAR ELK MOUNTAIN	CH	91.5	1957-	27	19N	82W	GW	Y	CF	WSE	
*06630000	N PLATTE RIVER AB SEMINOE RESERVOIR, NR SINCLAIR	CP	4175	1939-	13	22N	86W	GW	Y	CF	WSE	
*#06630300	BIG DITCH NEAR COYOTE SPRINGS	C	110	1975-	30	23N	83W	GW	Y	CF	BLM	
*#06630330	NORTH DITCH NEAR COYOTE SPRINGS	C	22.6	1976-	19	23N	83E	GW	Y	CF	BLM	
06632400	ROCK CREEK ABOVE KING CANYON CANAL, NR ARLINGTON	BCH	62.9	1965-	25	19N	79W	GW	Y	CF,S	WSE	
*#06634600	LITTLE MEDICINE BOW RIVER NEAR MEDICINE BOW	P	963	1973-	22	23N	78W	GW	Y	CF	WSE	
*#06634990	HANNA DRAW NEAR HANNA	C	21.6	1975-	34	24N	81W	GW	Y	CF	BLM	
*#06635000	MEDICINE BOW R AB SEMINOE RESERVOIR, NEAR HANNA	CP	2338	1939-	34	24N	81W	GW	Y	CF	WSE	
06635500	SEMINOE RESERVOIR NEAR LEO	C	7230	1939-	8	25N	84W	-	-	-	MRB	FURNISHED BY WPRS
06637750	ROCK CREEK ABOVE ROCK CREEK RESERVOIR	CH	9.2	1962-	27	30N	100W	DGW	Y	R	WSE	
06638090	SWEETWATER RIVER NEAR SWEETWATER STATION	P	849	1973-	12	29N	96W	GW	Y	R	WSE	
*#06639000	SWEETWATER RIVER NEAR ALCOVA	CP	2327	1913-24, 1938-	25	29N	87W	GW	S	S	WSE	
06640500	PATHFINDER RESERVOIR NEAR ALCOVA	C	10711	1909-	24	29N	84W	-	-	-	MRB	FURNISHED BY WPRS
06641500	ALCOVA RESERVOIR AT ALCOVA	C	10766	1938-	24	30N	83W	-	-	-	MRB	FURNISHED BY WPRS
*#06642000	NORTH PLATTE RIVER AT ALCOVA	CR	10812	1904-05, 1934-	17	30N	82W	DW	Y	C	WSE	
06645150	SMITH CREEK ABOVE OTTER CREEK, NEAR CASPER	C	9.91	1974-	15	31N	78W	GW	Y	C	USGS	DISC. 12/31/79
06645160	SMITH CREEK AT OTTER CREEK, NEAR CASPER	C	10.9	1974-	14	31N	78W	DTW	Y	C	USGS	DISC. 12/31/79
*06646600	DEER CREEK BELOW MILLAR WASTEWAY, AT GLENROCK	CH	213	1961-	4	33N	75W	GW	Y	C,S	WSE	
*#06646780	SAND CREEK NEAR GLENROCK	CH	79.9	1977-	5	33N	74W	DGW	Y	C	USGS	
*06646800	NORTH PLATTE RIVER NEAR GLENROCK	CR	13538	1959-	17	33N	74W	DW	Y	C,S	WSE	
06647500	BOX ELDER CREEK AT BOXELDER	H	63.0	1946-51, 1961-67, 1971-	32	31N	75W	GW	Y	C	WSE	
06647890	LITTLE BOX ELDER CREEK NEAR CAREYHURST	C	7.18	1974-	8	32N	74W	DW	Y	C	USGS	

* Also water-quality station.

# Also sediment station.

Table 1. Streamflow and reservoir stations (continued)

STATION NUMBER	STATION NAME	PUR-POSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
					SE	TSP	RNGE					
PLATTE RIVER BASIN (continued)												
06647900	L BOX ELDER C AT L BOX ELDER CAVE, NR CAREYHURST	C	8.47	1974-	9	32N	74W	GW	Y	C	USGS	
06649000	LAPRELE CREEK NEAR DOUGLAS	C	135	1919-	5	31N	73W	GW	S	S	WSE	
*#06652000	NORTH PLATTE RIVER AT ORIN	CR	14888	1895-99, 1917-18, 1924, 1958-	17	31N	69W	DW	Y	C	WSE	
06652700	GLENDO RESERVOIR NEAR GLENDO	C	15545	1957-	24	29N	68W	-	-	-	MRB	FURNISHED BY WPRS
*06652800	NORTH PLATTE RIVER BELOW GLENDO RESERVOIR	CR	15548	1957-	30	29N	67W	DW	Y	CF,S	WSE	
06655500	GURNSEY RESERVOIR NEAR GUERNSEY	C	16224	1928-	27	27N	66W	-	-	-	MRB	FURNISHED BY WPRS
*06656000	NORTH PLATTE RIVER BELOW GUERNSEY RESERVOIR	CR	16237	1900-	27	27N	66W	DMW	Y	CF,S	WSE	
06657000	NORTH PLATTE R BELOW WHALEN DIVERSION DAM	CR	16425	1909-	12	26N	65W	GM	Y	CF,S	WSE	
06659500	LARAMIE RIVER AND PIONEER CANAL NEAR WOODS	CR	434	1912-24, 1926-27, 1931-	36	14N	77W	GW	S	S	WSE	
06659580	SAND CREEK AT COLORADO-WYOMING STATE LINE	C	29.2	1968-	24	12N	75W	GW	S	S	WSE	
06661000	LITTLE LARAMIE RIVER NEAR FILMORE	CH	157	1902-03, 1911-26, 1932-	4	15N	77W	GW	S	S	WSE	
06661585	LARAMIE RIVER NEAR BOSLER	CR	1790	1972-	10	18N	74W	GW	Y	S	WSE	
*06662000	LARAMIE RIVER NEAR LOOKOUT	CR	2174	1912-17, 1921-27, 1932-	27	21N	74W	GW	S	S	WSE	
06664400	SYBILLE CREEK ABOVE MULE CREEK, NEAR WHEATLAND	CH	194	1974-	27	22N	70W	GW	S	S	WSE	
06664900	BLUEGRASS CREEK NEAR WHEATLAND	CR	139	1958-63, 1968-	22	22N	70W	GW	S	S	WSE	
06667060	LARAMIE RIVER ABOVE NORTH LARAMIE RIVER, NR UVA	CP	3131	1973-	19	25N	67W	GM	Y	CF	DEPD	DISC. 2/20/80
*#06670500	LARAMIE RIVER NEAR FORT LARAMIE	CR	4564	1915-	28	26N	64W	GM	Y	CF	WSE	
06671000	RAWHIDE CREEK NEAR LINGLE	C	522	1928-	20	25N	62W	GW	S	S	WSE	
06672500	CHERRY CREEK DRAIN NEAR TORRINGTON	C	356	1931-32, 1935-	23	24N	61W	GW	S	S	WSE	
06673500	KATZER DRAIN NEAR HENRY, NB	C	45.9	1928-	10	23N	60W	GW	S	S	WSE	
*#06674500	NORTH PLATTE R AT WYOMING-NEBRASKA STATE LINE	CR	22218	1929-	4	23N	58W	GW	Y	CF	WSE	
06675850	HORSE CREEK NEAR JOHNSON RANCH, NEAR LAGRANGE	C		1978-	36	19N	61W	GM	Y	CF	USGS	
06676550	HORSE CREEK AT WYCROSS RANCH, NEAR LAGRANGE	C	680	1965-73, 1978-	28	20N	61W	GW	Y	CF	USGS	
06676900	BEAR CREEK AT LAGRANGE	C		1978-	6	19N	61W	GM	Y	CF	USGS	
*06679500	NORTH PLATTE RIVER AT MITCHELL, NE	C	24300	1901-10, 1911, 1912-13, 1916-18, 1920-	33	33N	56W	DGW	Y	NE	-	
GREEN RIVER BASIN												
*09188500	GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL	C	468	1931-	8	35N	111W	GM	Y	GR	WSE	
09196500	PINE CREEK ABOVE FREMONT LAKE	BCH	75.8	1954-	5	35N	108W	DW	Y	GR	USGS	
09203000	EAST FORK RIVER NEAR BIG SANDY	C	79.2	1938-	7	31N	105W	DW	Y	GR	WSE	
*09205000	NEW FORK RIVER NEAR BIG PINEY	P	1230	1954-	22	30N	110W	DW	Y	GR	WSE	
09208000	LABARGE CREEK NR LABARGE MEADOWS RANGER STATION	BCH	6.3	1940-42, 1950-	8	29N	116W	GM	Y	GR	USGS	
*#09209400	GREEN RIVER NEAR LABARGE	CP	3910	1963-	33	26N	112W	DW	Y	GR	WSE	
09210500	FONTENELLE CR NR HERSCHLER RANCH, NR FONTENELLE	CH	152	1951-	2	24N	115W	GM	Y	GR	USGS	

* Also water-quality station.

Also sediment station.

Table 1. Streamflow and reservoir stations (continued)

STATION NUMBER	STATION NAME	PURPOSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
					SE	TSP	RNGE					
GREEN RIVER BASIN (continued)												
09211150	FONTENELLE RESERVOIR NEAR FONTENELLE	C	4280	1964-	25	24N	112W	-	-	-	-	FURNISHED BY WPRS
*09211200	GREEN RIVER BELOW FONTENELLE RESERVOIR	CR	4280	1963-	31	24N	111W	DGW	Y	GR	WPUC	
09212500	BIG SANDY RIVER AT LECKIE RANCH, NEAR BIG SANDY	C	94.0	1910-11, 1939-	17	30N	104W	GW	S	GR	WSE	
#09213500	BIG SANDY RIVER NEAR FARSON	CR	322	1914-17, 1920-24, 1926-34, 1935-	17	27N	106W	DW	S	GR	WSE	
*#09214500	LITTLE SANDY CREEK ABOVE EDEN	C	134	1954-	11	26N	105W	DW	Y	GR	BLM	
*#09216000	BIG SANDY RIVER BELOW EDEN	CR	1610	1954-	31	24N	107W	DW	Y	GR	WPUC	
09216050	BIG SANDY RIVER AT GASSON BRIDGE, NEAR EDEN	CR	1720	1972-	29	23N	108W	DW	Y	GR	WPUC	
*#09216527	SEPARATION CREEK NEAR RINER	C	55.3	1975-	32	20N	90W	GW	Y	CF	BLM	
*#09216545	BITTER CREEK NEAR BITTER CREEK	C	308	1975-	36	18N	99W	GW	Y	GR	USGS	
*#09216562	BITTER CREEK AB SALT WELLS CREEK, NR SALT WELLS	C	836	1976-	2	19N	103W	GW	Y	GR	BLM	
*#09216565	SALT WELLS CREEK NEAR SOUTH BAXTER	C	34.7	1976-	15	14N	103W	GW	Y	GR	BLM	
*#09216750	SALT WELLS CREEK NEAR SALT WELLS	C	526	1976-	14	19N	103W	GW	Y	GR	BLM	
*#09217000	GREEN RIVER NEAR GREEN RIVER	CR	14000	1951-	26	18N	107W	GW	Y	GR	USGS	
09217900	BLACKS FORK NEAR ROBERTSON	H	130	1937-39, 1966-	27	3N	12E	GW	Y	GR	USE	
09218500	BLACKS FORK NEAR MILLBURNE	C	152	1939-	11	12N	117W	GW	Y	GR	WSE	
09220000	EAST FORK OF SMITH FORK NEAR ROBERTSON	CH	53.0	1939-	5	12N	115W	GW	S	S	WSE	
09220500	WEST FORK OF SMITH FORK NEAR ROBERTSON	CH	37.2	1939-	15	12N	116W	GW	S	S	WSE	
*#09222000	BLACKS FORK NEAR LYMAN	CR	821	1937-57, 1962-	15	17N	113W	DW	Y	GR	WPUC	
*#09222300	LITTLE MUDDY CREEK NEAR GLENCOE	C	416	1976-	31	19N	116W	GW	Y	GR	BLM	
*#09222400	MUDDY CREEK NEAR HAMPTON	C	963	1975-	18	18N	113W	GW	Y	GR	BLM	
09223000	HAMS FORK BELOW POLE CREEK, NEAR FRONTIER	CH	128	1952-	35	25N	117W	GW	Y	GR	USGS	
*#09224700	BLACKS FORK NEAR LITTLE AMERICA	CR	3100	1962-	15	18N	109W	DW	Y	GR	USGS	
09228500	BURNT FORK NEAR BURNTFORK	CH	52.8	1943-	36	3N	16E	GW	S	S	WSE	
09229500	HENRYS FORK NEAR MANILA, UT	CP	520	1928-	23	12N	109W	DW	Y	GR	USGS	
*#09235300	VERMILLION CREEK NEAR HIAWATHA, CO	C	196	1975-	15	12N	100W	GW	Y	GR	BLM	
#09257000	LITTLE SNAKE RIVER NEAR DIXON	CP	988	1910-23, 1938-	8	12N	90W	GW	S	CO	WSE	
BEAR RIVER BASIN												
10015700	SULPHUR CREEK ABOVE RESERVOIR, NEAR EVANSTON	CH	64.2	1957-	35	14N	119W	GW	Y	U	-	
10015900	SULPHUR CREEK BELOW RESERVOIR, NEAR EVANSTON	C	69.2	1958-	28	14N	119W	DW	Y	U	-	
10019500	CHAPMAN CANAL AT STATE LINE, NEAR EVANSTON	C	-	1942-	36	17N	121W	GW	Y	U	-	
*10020100	BEAR RIVER ABOVE RESERVOIR, NEAR WOODRUFF, UT	CR	752	1961-	29	17N	120W	GW	Y	U	-	
10020200	WOODRUFF NARROWS RESERVOIR NEAR WOODRUFF, UT	C	784	1965-	32	18N	120W	-	-	-	-	
10020300	BEAR RIVER BELOW RESERVOIR, NEAR WOODRUFF, UT	CR	784	1961-	32	18N	120W	DW	Y	U	-	
*#10027000	TWIN CREEK AT SAGE	C	246	1943-62, 1976-	7	21N	119W	GW	Y	GR	BLM	
10028500	BEAR RIVER BELOW PIXLEY DAM, NEAR COKEVILLE	CR	2032	1941-43, 1952-56, 1958-	25	23N	120W	GW	S	U	-	
10032000	SMITHS FORK NEAR BORDER	BCH	165	1942-	33	27N	118W	GW	Y	U	-	
10038000	BEAR RIVER BELOW SMITHS FORK, NEAR COKEVILLE	C	2447	1954-	28	25N	119W	GW	Y	U	-	
10041000	THOMAS FORK NEAR WYOMING-IDAHO STATE LINE	CH	113	1949-	19	28N	119W	DW	Y	U	-	

* Also water-quality station.

# Also sediment station.

Table 1. Streamflow and reservoir stations (continued)

STATION NUMBER	STATION NAME	PUR-POSE	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	GAGE EQUIPMENT	CURRENT RECORD TYPE	FIELD OFFICE	FUNDING AGENCY	REMARKS
SNAKE RIVER BASIN												
13010500	JACKSON LAKE NEAR MORAN	C	807	1908-	18	45N	114W	-	-	I	-	FURNISHED BY WPRS
13011000	SNAKE RIVER NEAR MORAN	BCR	807	1903-	18	45N	114W	DW	Y	I	-	
13011900	BUFFALO FORK ABOVE LAVA CREEK, NEAR MORAN	H	323	1965-	29	45N	113W	GW	Y	I	-	
*#13018300	CACHE CREEK NEAR JACKSON	BH	10.6	1962-	1	40N	116W	GW	Y	GR	USGS	HYDRO BENCHMARK STA
13018750	SNAKE RIVER BELOW FLAT CREEK NEAR JACKSON	CR	2627	1975-	3	39N	116W	DGW	Y	I	-	
*13022500	SNAKE RIVER ABOVE RESERVOIR, NEAR ALPINE	CR	3465	1917-18, 1937-39, 1953-	-	-	-	GW	Y	I	-	
13023000	GREYS RIVER ABOVE RESERVOIR, NEAR ALPINE	CP	448	1917-18, 1937-39, 1953-	34	37N	118W	GW	Y	I	-	
13025000	SWIFT CREEK NEAR AFTON	CH	27.4	1942-	29	32N	118W	GW	S	S	WSE	
*13027500	SALT RIVER ABOVE RESERVOIR, NEAR ETNA	CR	829	1953-	28	36N	119W	DW	Y	I	-	
13046500	GRASSY LAKE NEAR MORAN	C	10.4	1939-	18	48N	116W	-	-	-	-	FURNISHED BY WPRS

* Also water-quality station.
# Also sediment station.

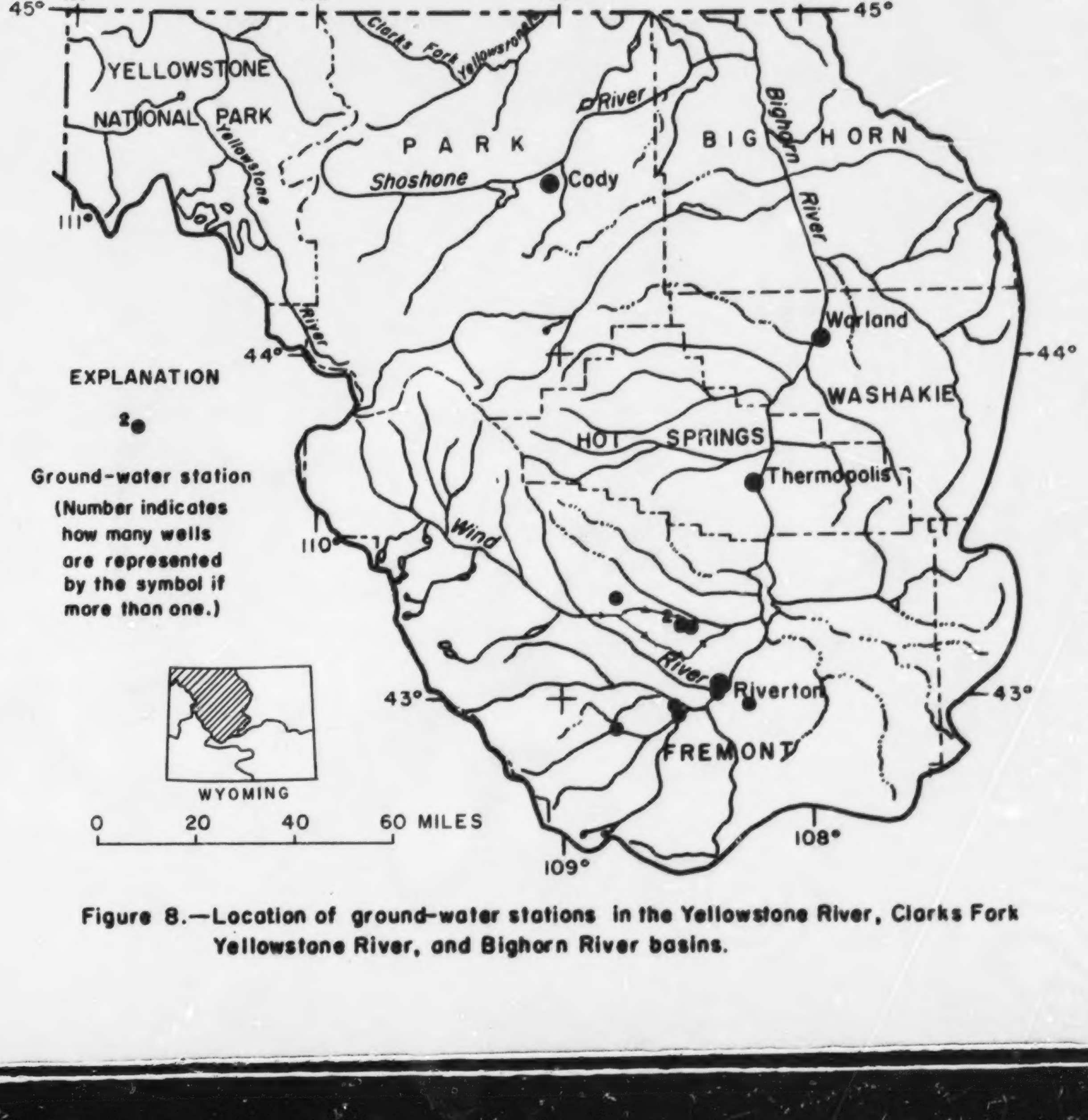

111°
110°
109°
108°
45°
45°
Clarks Fork Yellowstone
YELLOWSTONE
NATIONAL PARK
Yellowstone
River
P A R K
Shoshone
River
Cody
Bighorn
River
BIG HORN
Warland
44°
44°
WASHAKIE
HOT SPRINGS
Thermopolis
110°
Wind
River
Riverton
FREMONT
43°
43°
108°
109°
111°
EXPLANATION
2
Ground-water station
(Number indicates how many wells are represented by the symbol if more than one.)
WYOMING
0
20
40
60 MILES

Figure 8.—Location of ground-water stations in the Yellowstone River, Clarks Fork Yellowstone River, and Bighorn River basins.

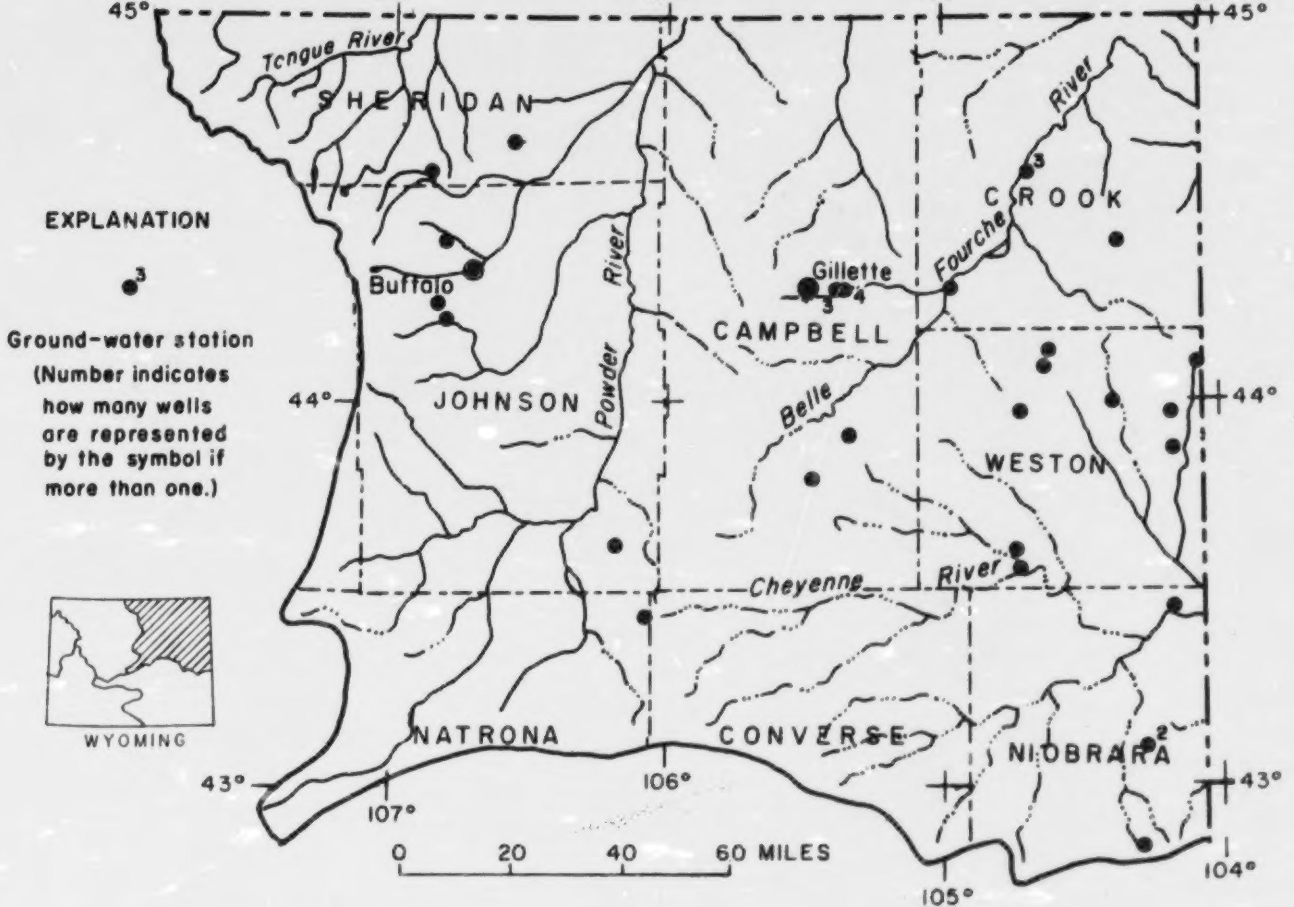

EXPLANATION
3
Ground-water station (Number indicates how many wells are represented by the symbol if more than one.)
WYOMING
45°
107°
106°
105°
104°
44°
43°
Tongue River
SHERIDAN
Buffalo
JOHNSON
Powder River
CAMPBELL
Gillette
3
4
Belle Fourche River
CROOK
WESTON
Cheyenne River
NATRONA
CONVERSE
NIOBRARA
2
0
20
40
60 MILES

Figure 9.—Location of ground-water stations in the Tongue River, Powder River, Belle Fourche River, and Cheyenne River basins.

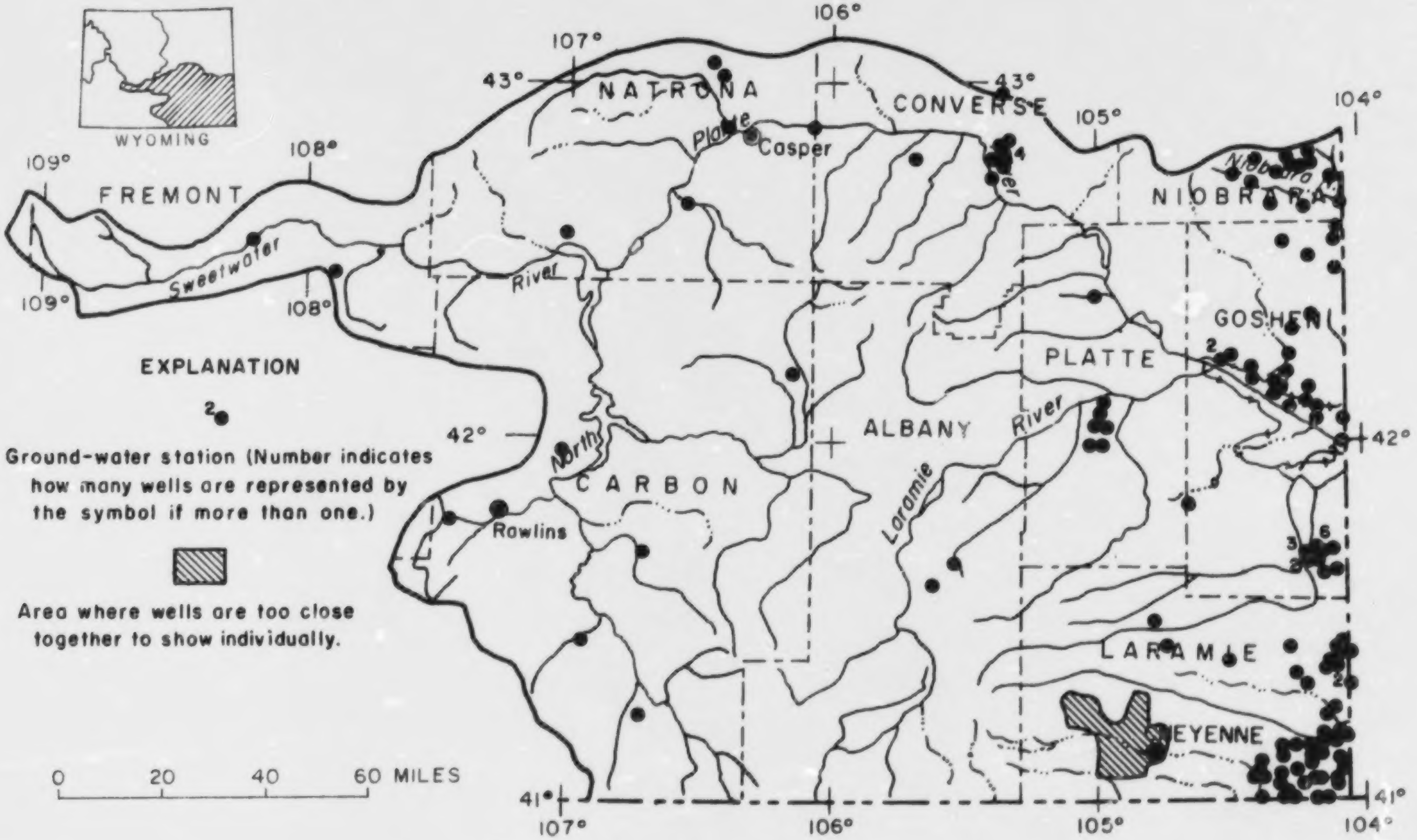

WYOMING
106°
107°
43°
NATRONA
CONVERSE
43°
104°
105°
Platte
Casper
109°
108°
FREMONT
NIOBRARA
Niobrara
Sweetwater
River
109°
108°
GOSHEN
PLATTE
EXPLANATION
2
Ground-water station (Number indicates how many wells are represented by the symbol if more than one.)
Area where wells are too close together to show individually.
42°
ALBANY
River
42°
North
CARBON
Laramie
Rawlins
3
6
2
LARAMIE
2
CHEYENNE
0
20
40
60 MILES
41°
107°
106°
105°
104°
41°

Figure 10.—Location of ground-water stations in the Niobrara River and Platte River basins.

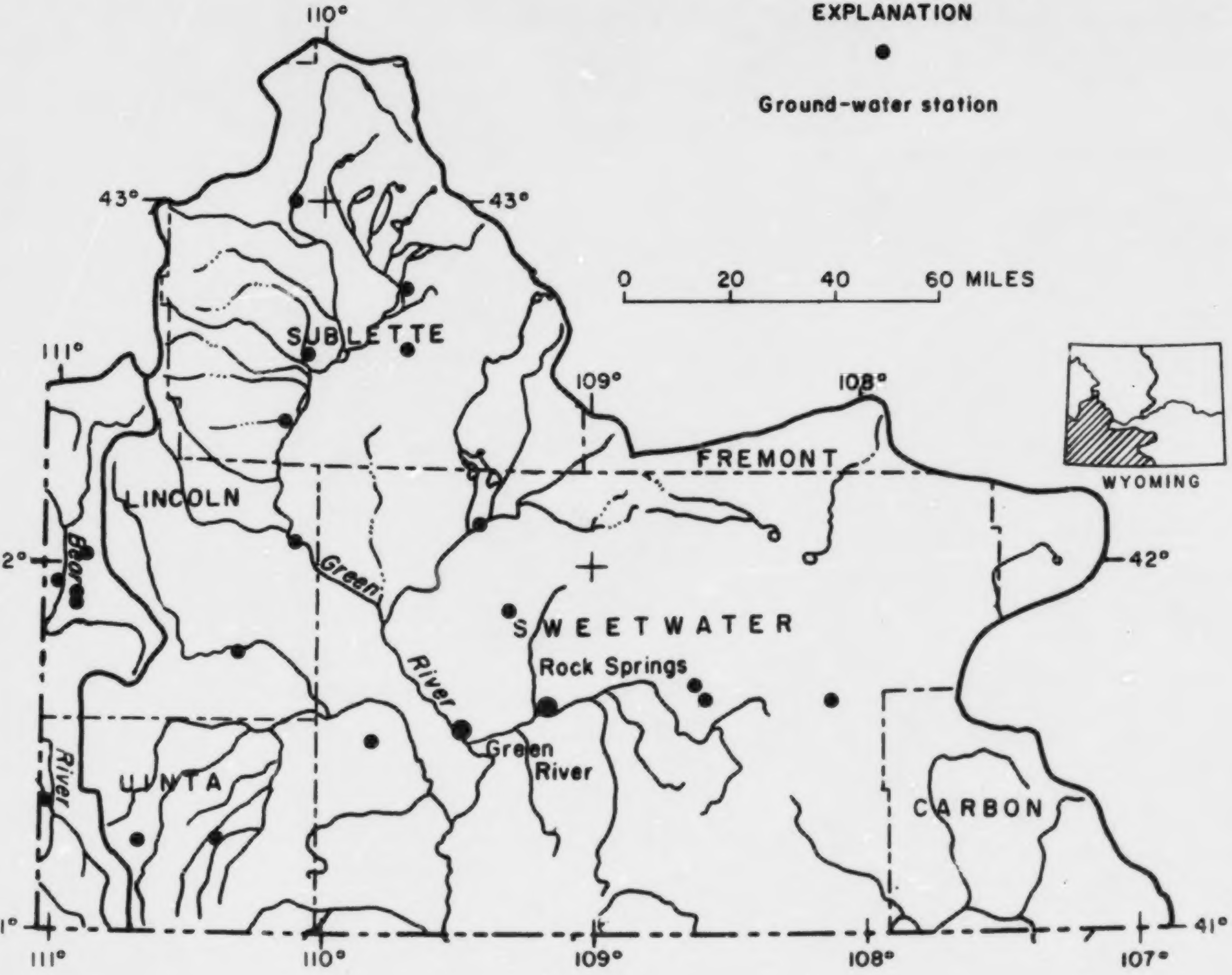

EXPLANATION
● Ground-water station
0 20 40 60 MILES
110°
43°
43°
111°
109°
108°
42°
42°
41°
41°
111°
110°
109°
108°
107°
SUBLETTE
FREMONT
LINCOLN
SWEETWATER
Rock Springs
Green River
Green River
Bear River
UINTA
CARBON
WYOMING

Figure 11.—Location of ground-water stations in the Green River and Bear River basins.

Ground-water stations

Explanation of abbreviations and codes used in table 2.

Well number: The well-numbering system used is based on the location in the public land classification of the U.S. Bureau of Land Management. The first segment of the number is the township (north); the second number segment is the range (west); the third number segment is the section, which is followed by a first letter designating the quarter section, a second letter, if shown, designating the quarter-quarter section, etc., (A-NE¼, B-NW¼, C-SW¼, D-SE¼). Well 30-108-05BCD2, for example, is in the SE¼ of the SW¼ of the NW¼ of sec. 5, T. 30 N., R. 108 W. The number 2 indicates it is the second well in the quarter-quarter-quarter section. Wells shown in Fremont County have an additional uppercase letter that begins the number. This letter designates the quadrant of the Wind River Meridian and Base Line System. The quadrants are lettered A, B, C, and D in a counter-clockwise direction beginning with A in the northeast quadrant.

Lat-Long-Seq No.: The first six digits are the latitude in degrees, minutes, and seconds. The next seven digits are the longitude in degrees, minutes, and seconds. The last two digits indicate the sequence number of when the well was inventoried in the event more than one well has the same latitude and longitude.

Geologic Unit:

111 ALVM	Alluvium
111 TRRC	Terrace deposits
121 NRPK	North Park Formation
121 OGLL	Ogallala Formation
122 ARKR	Arikaree Formation
123 BRUL	Brule Formation
123 WRVR	White River Formation or Group
124 LNEY	Laney Shale Member of Green River Formation
124 WDRV	Wind River Formation
124 WSTC	Wasatch Formation
125 FRUN	Fort Union Formation
211 ALMD	Almond Formation
211 FXHL	Fox Hills Sandstone
211 LNCE	Lance Formation
211 MVRD	Mesaverde Formation or Group
211 STEL	Steele Shale
217 LKOT	Lakota Formation
221 SNDC	Sundance Formation
237 SPRF	Spearfish Formation
317 FRLL	Forelle Limestone Member of Goose Egg Formation
317 MNKT	Minnekahta Limestone
331 MDSN	Madison Limestone
337 PHSP	Pahasapa Limestone
374 FLTD	Flathead Quartzite or Sandstone

The seven-character geologic unit code given above consists of two parts. The first three characters are numeric and identify the Era, System, and Series of the rock unit. The next four characters are in alpha mnemonic code for the name of the rock-stratigraphic unit.

Explanation of abbreviations and codes used in table 2--continued

Numeric Codes for Geologic Age Identification

	Code		Code
Cenozoic	100	Paleozoic--continued	
Quaternary	110	Pennsylvanian	320
Holocene	111	Upper	321
Pleistocene	112	Middle	324
Tertiary	120	Lower	327
Pliocene	121	Mississippian	330
Miocene	122	Upper	331
Oligocene	123	Lower	337
Eocene	124	Devonian	340
Paleocene	125	Upper	341
Mesozoic	200	Middle	344
Cretaceous	210	Lower	347
Upper	211	Silurian	350
Lower	217	Upper	351
Jurassic	220	Middle	354
Upper	221	Lower	357
Middle	224	Ordovician	360
Lower	227	Upper	361
Triassic	230	Middle	364
Upper	231	Lower	367
Middle	234	Cambrian	370
Lower	237	Upper	371
Paleozoic	300	Middle	374
Permian	310	Lower	377
Upper	311	Precambrian	400
Lower	317		

Explanation of abbreviations and codes used in table 2--Continued

Funding Agency:
CHEY, City of Cheyenne
USGS, Geological Survey, Federal Program
WSE, Wyoming State Engineer

Field Office:
B, Buffalo
C, Casper
CF, Cheyenne Field Unit
CH, Cheyenne Hydrologic Surveillance Section
GR, Green River
O, Observer
P, Project Personnel
R, Riverton
S, Wyoming State Engineer
SD, South Dakota District

Frequency of Observation:
C, continuous (graphic or digital recorder)
M, monthly (12 visits per year)
Q, quarterly (4 visits per year)
SA, semiannual (2 visits per year)
A, annual (1 visit per year)
I, infrequent or as required

Period of Record: The dates given are the calendar years in which records began or ended. A record consists of one or more measurements during a calendar year.

Remarks: Recorder 77- indicates a continuous recorder has been operated at the site from 1977 to present.

Table 2. Ground-water stations

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
ALBANY COUNTY	MISSOURI RIVER BASIN							
19-073-02CDD	413816105325601	317FRLL	WSE	CF	SA	65-68,70-	GIL SMITH	
19-074-36CCA	413424105390301	211STEL	WSE	CF	SA	68,70-	O. L. SCHMIDL	
CAMPBELL COUNTY	MISSOURI RIVER BASIN							
44-072-22CC 01	434611105295001	124WSTC	WSE	C	SA	66-	DURHAM MEAT CO.	
46-071-34DDC01	435502105215001	211FXHL	WSE	P	C	76-	MR. EDWANDS	RECORDER 79-
50-071-21BBB01	441816105243101	125FRUN	WSE	C	M	74-	USGS	
50-071-27AAC01	441749105221901	111ALVM	WSE	C	I	74-	USGS	
50-071-27BAA02	441728105224802	125FRUN	WSE	C	I	74-	USGS	
50-071-27BAD01	441716105224901	111ALVM	WSE	C	I	74-	USGS	
50-071-33BAC01	441628105240801	125FRUN	WSE	C	C	74-	USGS	RECORDER 74-
50-071-33BAC02	441628105240802	125FRUN	WSE	P	M	74-	USGS	
50-071-33BAC03	441628105240803	111ALVM	WSE	P	M	74-	USGS	
CARBON COUNTY	MISSOURI RIVER BASIN							
15-083-32DDD01	411307106442601	121NRPK	WSE	CF	SA	67-68,70-	HENRY FINCH	
17-085-23AAC01	412610106552401	121NRPK	WSE	CF	SA	77-	L. F. WALCK	
20-083-28BAB	414104106442701	121NRPK	WSE	CF	SA	50-	STATE OF WYOMING	
21-089-22ADA	414650107254501	125FRUN	WSE	CF	SA	63,65-	BLM	
23-085-19DBD	415652107014201	211MVRD	WSE	CF	SA	67-68,70-	MILLER ESTATE	
25-078-03CCC	420936106105001	111ALVM	WSE	CF	SA	68,70-		
CONVERSE COUNTY	MISSOURI RIVER BASIN							
32-071-02DAA01	424628105194201	125FRUN	WSE	C	SA	75-	ART SIMS	
32-071-04BDD01	424631105224301	125FRUN	WSE	C	SA	75-		
32-071-11BAB01	424558105204401	125FRUN	WSE	C	SA	75-		
32-071-31AAA	424229105242901	123WRVR	WSE	C	SA	50-56,59-	SALLIE EDWARDS	
32-074-03BCD	424620105424201	331MDSN	WSE	C	C	74-	WM BARBER	RECORDER 74-
33-071-24DAA01	424902105192301	125FRUN	WSE	C	SA	75-	RAYMOND BAKER	
33-071-26DAD01	424801105200901	125FRUN	WSE	C	SA	75-	ART SIMS	
33-071-34ACD01	424722105214301	125FRUN	WSE	C	SA	75-	D.W. FUNK	
33-071-34ACD02	424723105213602	125FRUN	WSE	C	SA	75-	ROY JARMUN	
33-071-34ADC01	424723105213001	125FRUN	WSE	C	SA	75-	PHILLIPS PETROLEUM	
33-071-34BBC01	424734105222801	125FRUN	WSE	C	SA	75-	ROY JAHMON	
35-071-23CC01	425910105211001		USGS	P	A	75-	PANHANDLE EASTERN	
CROOK COUNTY	MISSOURI RIVER BASIN							
50-068-36AD	441620104575001	211LNCE	WSE	C	SA	69-	STATE OF WYOMING	
51-063-23AAC	442340104225001	221SNDC	WSE	C	SA	68,75-	CITY OF SUNDANCE	
53-065-18BAC	443503104425101	317MNKT	WSE	C	SA	55,60,62-	NATIONAL PARK SERVICE	
53-065-18BBD01	443450104430001	237SPRF	WSE	C	SA	62-	NATIONAL PARK SERVICE	
53-065-18BBD02	443453104425602	337PHSP	WSE	C	SA	62-	NATIONAL PARK SERVICE	
FREMONT COUNTY	MISSOURI RIVER BASIN							
29-093-36DB	422632107540501	122ARKH	WSE	R	C	74-	STATE OF WYOMING	RECORDER 74-

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
FREMONT COUNTY	MISSOURI RIVER BASIN (continued)							
30-095-31AD	423127108132201	122ARKR	WSE	R	SA	65,73-		
A 1-4-33DDB	430051108240901	124WDRV	WSE	R	C	51,61-	TETON STUDS CORP.	RECORDER 66-
A 3-3-21ADA01	431326108311001	124WDRV	WSE	R	SA	49,65-	H. W. ROLAND	
A 3-3-21ADA02	431327108311102	124WDRV	WSE	R	SA	48-	H. W. ROLAND	
A 3-3-25BBB	431253108284401	124WDRV	WSE	R	SA	49-	WPRS	
A 4-1-18DBC	431915108481501	124WDRV	WSE	R	SA	66-67,70-	USGS	
D 1-3-07DCD	425900108335401	124WDRV	WSE	R	SA	66-67,70-	USGS	
D 1-3-29CCC	425623108332401	124WDRV	WSE	R	SA	66-67,70-	USGS	
D 1-5-11BDD	425931108151301	111ALVM	WSE	R	SA	65-67,70-	USGS	
D 2-1-06DDD	425437108474101	111ALVM	WSE	R	SA	65-67,70-	I. W. SEAMANDS	
GOSHEN COUNTY	MISSOURI RIVER BASIN							
19-060-08ABB03	413809104060203	123BRUL	WSE	CH	SA	74-	JERRY CHAMBERLIN	
19-061-02CCD	413816104094901	111ALVM	WSE	CH	SA	43,49-69,72-	CITY OF LAGRANGE	
19-061-04ABC	413852104114901	111ALVM	WSE	CH	C	72-	FRANK SANDERS	RECORDER 73-
19-061-04CDD02	413813104115702	111ALVM	WSE	CH	SA	43,48-69,72-	HUGH STEMLER	
19-061-13BAA	413715104082701	123BRUL	WSE	CH	SA	72-	FLORA VANDENEL	
20-060-30CBB	414023104074501	123BRUL	WSE	CH	SA	72-	JOHN MEIER & SON, INC.	
20-061-21DDD	414051104112201	111ALVM	WSE	CH	SA	70-	CURTIS MEIER	
20-061-23CCC	414051104100701	111ALVM	WSE	CH	C	72-	USGS	RECORDER 73-
20-061-23DBB02	414104104091702	111ALVM	WSE	CH	SA	72-	CURTIS MEIER	
20-061-24CDD	414052104083001	123BRUL	WSE	CH	SA	76-	JOHN MEIER & SON, INC.	
20-061-25CBC02	414017104085702	111ALVM	WSE	CH	SA	72-	JOHN MEIER & SON, INC.	
20-061-25DCC	414002104081601	123BRUL	WSE	CH	SA	76-	CURTIS MEIER	
20-061-27DDA	414005104101701	111TRRC	WSE	CH	SA	43,49-70,72-	CURTIS TEMPLIN	
20-061-30BAC	414043104142301	123BRUL	WSE	CH	SA	72-	JAMES WARD	
20-061-31BCB	413944104144101	123BRUL	WSE	CH	SA	72-	LOVERCHECK LAND & CATTLE	
20-061-31DAD	413919104134101	123BRUL	WSE	CH	SA	72-	WARD HAY & CATTLE CO.	
20-061-33CCB	413917104122401	111ALVM	WSE	CH	SA	72-	FRANK SANDERS	
23-060-10AAC	415902104031601	111ALVM	WSE	CH	Q	50-	FRENCH IRR. DIST.	
24-060-28CBD	420141104051501	111ALVM	WSE	CH	Q	62-		
24-061-05CBB02	420449104133402	111ALVM	WSE	CH	Q	51-	USGS	
24-061-11BBB	420426104100601	111TRRC	WSE	CH	Q	62-	BILL RING	
24-061-23CCB	420204104100601	111ALVM	WSE	CH	Q	62-	USGS	
24-062-11AAA	420429104155801	111ALVM	WSE	CH	Q	62-	USGS	
25-061-28DBC	420626104114501	111TRRC	WSE	CH	Q	43,48-52,54-	H. W. BERRY	
25-062-02BBB	421031104170001	111ALVM	WSE	CH	Q	62-	USGS	
25-062-19AAB	420753104204701	111ALVM	WSE	CH	Q	48-53,55-	LESTER STRUUD	
25-062-27BDC02	420640104175402	111ALVM	WSE	CH	Q	62-	USGS	
25-062-31ADC	420548104204801	111ALVM	WSE	CH	Q	62-	USGS	
25-063-09CCB	420900104262201	111ALVM	WSE	CH	Q	43,48-	EMERY BRIGHT	
26-062-14BBA	421357104165001	111ALVM	WSE	CH	Q	48-	LESTER DUNTEN	
26-063-32DAC	421044104263201	111ALVM	USGS	CH	Q	48-	JOSEPH SPECKNER	
26-064-23CDA	421233104303401	111ALVM	USGS	CH	Q	62-	USGS	
26-064-28BBB	421216104332301	111ALVM	WSE	O	M	48-	NPS-FED NO. 2	
26-064-29ADA	421205104333001	111ALVM	WSE	O	M	42-43,46-	NPS	
28-061-06ABA	422512104135501		WSE	S	C	79-	STATE ENGINEER	RECORDER 79-
29-061-08CDC	422946104131001	122ARKR	WSE	CH	SA	49-51,70,75-	GERALD STURMAN	
29-061-23ABB	422849104090801		WSE	S	C	79-	STATE ENGINEER	RECORDER 79-

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
GOSHEN COUNTY	MISSOURI RIVER BASIN (continued)							
29-061-26ACC	422734104092501	122ARKR	WSE	CH	C	74-		RECORDER 75-
30-060-04DAA	423603104041001	122ARKR	WSE	CH	SA	72-	WM IMMESOETA	
30-060-29BBC	423255104062301	122ARKR	WSE	CH	SA	72-	OTTO YORK	
30-062-33DCA	423130104183401	122ARKR	WSE	CH	SA	74-	RONALD PODALAK	
JOHNSON COUNTY	MISSOURI RIVER BASIN							
42-078-14DDB	433618106112901	211LNCE	WSE	C	SA	65-	W. B. LINCH	
49-083-05DCB	440912106512001	374FLTD	WSE	B	I	74-	MOBIL OIL	RECORDER 79-
49-083-27DBA02	441112106493502	331MDSN	WSE	B	C	74-	MOBIL OIL	RECORDER 74-
51-083-10ACB	442427106494001	124WSTC	WSE	B	SA	60-	HELEN RAUCH	
LARAMIE COUNTY	MISSOURI RIVER BASIN							
12-060-07DDD	410059104072401	123BRUL	WSE	S	C	77-	STATE ENGINEER	RECORDER 77-
12-061-06CBB	410218104152201	111TRRC	WSE	CH	M	69-	KENNETH THOMPSON	
12-061-15DDD	410007104105301	123BRUL	WSE	CH	M	70-	USGS	
12-062-07BCA	410135104220301	111TRRC	WSE	CH	M	77-	MARVIN MCNALLY	
12-062-10BBC	410145104184101	111TRRC	WSE	CH	M	70-		
12-062-13BAA	410100104160301	111TRRC	WSE	CH	C	75-	STATE ENGINEER	RECORDER 75-
12-062-18DDB	410050104211701	111ALVM	WSE	CH	M	77-	FRANCIS BLAKE	
12-062-22ABB	410008104181101	111TRRC	WSE	CH	M	52,70-	FRANK DWINNELL	
12-063-15AAA02	410059104243202	123BRUL	WSE	CH	C	73-	USGS	RECORDER 72-
13-060-05CCB	410703104071201	123BRUL	WSE	CH	C	69-	ELMER GLANTZ	RECORDER 72-
13-060-20BBC	410458104071201	123BRUL	WSE	CH	M	46,70-	BERNARD MORTIZ	
13-060-31AAA	410322104071701	123BRUL	WSE	CH	M	40-	W. I. YOUNG	
13-061-04CBC	410710104125801	123BRUL	WSE	CH	M	53,59,65,70-	CLAUS PLAMBECK	
13-061-33CCC	410234104125601	123BRUL	WSE	CH	M	70-	TOM PORTER	
13-061-35CCC	410237104104101	111TRRC	WSE	CH	M	70-	A. M. IDE	
13-062-04DDD	410654104184301	123BRUL	WSE	CH	M	70-	USGS	
13-062-08CBD01	410646104204701	121OGLL	WSE	CH	M	77-	PAUL MURDOCH	
13-062-28BCC	410356104195001	111TRRC	WSE	CH	M	70-		
13-063-20CCD02	410419104274201	121OGLL	WSE	CH	M	77-	MARK FOSTER	
13-063-27DDC	410330104244501	123BRUL	WSE	CH	M	70-		
13-063-32DCC	410237104271801	123BRUL	WSE	CH	M	72-		
13-063-35CCC	410235104242801	123BRUL	WSE	CH	M	71-	USGS	
13-064-02DAC	410711104302601	121OGLL	WSE	CH	M	77-	DEXTER MCGHEW	
13-064-23AAA	410510104301401	121OGLL	WSE	CH	M	77-	MARK FOSTER	
13-067-06BCB	410738104563501	121OGLL	CHEY	CH	A	67-	ART KING	
13-067-07DAD	410622104552801	121OGLL	CHEY	CH	A	63-64,67-	ART KING	
13-067-15BBA	410608104525201	121OGLL	CHEY	CH	A	41-43,49-50,64-65,67-68, 71-	WARREN LIVESTOCK CO.	
13-067-16ABC	410557104534101	121OGLL	CHEY	CH	A	41-43,50,64-65,67-	WARREN LIVESTOCK CO.	
13-067-19CAA	410446104560501	121OGLL	CHEY	CH	A	41-42,50,64,67-	DUCK CREEK GRAZING ASSN.	
13-067-27BBA	410420104525601	121OGLL	CHEY	CH	A	41-42,50,63,65,67-	DUCK CREEK GRAZING ASSN.	
13-067-28BCD	410401104540801	121OGLL	CHEY	CH	A	63,67,69-	DUCK CREEK GRAZING ASSN.	
13-067-34BBA	410330104525801	121OGLL	CHEY	CH	A	63-	STATE OF WYOMING	
13-068-01BCD	410731104572901	121OGLL	CHEY	CH	A	63,67-	ART & JERRY KING	
13-068-03BBA	410747104594801	121OGLL	CHEY	CH	A	44-	CITY OF CHEYENNE	
13-068-04ADC	410729105001801	121OGLL	CHEY	CH	A	44-	CITY OF CHEYENNE	

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
LARAMIE COUNTY	MISSOURI RIVER BASIN (continued)							
13-068-04CBD	410717105010101	1210GLL	CHEY	CH	A	45-48,50-	CITY OF CHEYENNE	
13-068-0[illegible]DCC	410707105002801	1210GLL	CHEY	CH	A	44-48,50-	CITY OF CHEYENNE	
13-068-09BAC	410640105004801	1210GLL	CHEY	CH	A	44,55,68-	ART KING	
13-068-11ACC	410642104581201	1210GLL	CHEY	CH	A	69-	ART KING	
13-068-12CCA	410622104573501	1210GLL	CHEY	CH	A	69-	CHEVRON OIL CO.	
13-068-12DCA	410623104565601	1210GLL	CHEY	CH	A	63-64,67-	ART & JERRY KING	
13-068-12DCC	410622104573201	1210GLL	CHEY	CH	A	70-	ART KING	
13-068-13CCC	410530104574001	1210GLL	CHEY	CH	C	42-50,69-	ART KING	RECORDER 72-
13-068-14BBB	410608104584901	1210GLL	CHEY	CH	A	45-50,69-	CITY OF CHEYENNE	
13-068-14CBD	410501104583901	1210GLL	CHEY	CH	A	45-	CITY OF CHEYENNE	
13-068-15CBD	410537104594701	1210GLL	CHEY	CH	A	63,68,70-	ART & JERRY KING	
13-068-16DBA	410542105002201	1210GLL	CHEY	CH	A	63,67,69-	ART & JERRY KING	
13-068-16DBD	410534105002401	1210GLL	CHEY	CH	A	49-	CITY OF CHEYENNE	
13-068-17CCB	410531105021601	1210GLL	CHEY	CH	A	65,67-69,71-	BELVOIR GRAZING ASSN.	
13-068-22BDC	410453104594401	1210GLL	CHEY	CH	A	41,42,50,64-	BELVOIR GRAZING ASSN.	
13-068-23BBC	410507104585201	1210GLL	CHEY	CH	A	67-	BELVOIR GRAZING ASSN.	
13-068-24AAD	410506104563701	1210GLL	CHEY	CH	A	64,67-	CITY OF CHEYENNE	
13-068-34ADD	410314104585801	1210GLL	CHEY	CH	A	61-69,71-	CITY OF CHEYENNE	
13-068-34DAC	410255104590401	1210GLL	CHEY	CH	A	41,63-	WARREN LIVESTOCK	
14-060-05BCB	410238104070801	123BRUL	WSE	CH	C	57-	C. C. GROSS	RECORDER 72-
14-060-10DBB	411131104041801	123BRUL	WSE	CH	C	73-	USGS	RECORDER 73-
14-060-19BDA03	411001104075001	111TRRC	WSE	CH	M	42,71-	DALE ROWERS	
14-061-18DDD01	411022104141201	123WRVR	WSE	CH	C	77-	LARAMIE CO. WELL #2	RECORDER 77-
14-061-22DCC	410900104110701	123BRUL	WSE	CH	C	75-	SHERIL BROWN	RECORDER 75-
14-061-23AAB	411019104094501	123BRUL	WSE	CH	M	71-	WALTER BROWN	
14-061-25CCB	410847104093101	123BRUL	WSE	CH	M	70-	JAY BROWN	
14-062-06AAC	411246104211301	1210GLL	WSE	CH	M	77-	ALEX PAVLICA	
14-062-20CCB	410940104205501	122ARKR	WSE	CH	M	59,64,70-	JOHN BASTIAN	
14-062-24BAB	411019104160204	123BRUL	WSE	CH	M	70-	MINNICK	
14-063-15AAA	411114104242501	122ARKR	WSE	CH	C	77-	LARAMIE CO. WELL #3	RECORDER 77-
14-063-18DDD	411025104275501	1210GLL	WSE	CH	M	77-	CLEO ROBERTSON	
14-064-01DCB	411214104293301	1210GLL	WSE	CH	C	77-	HOLLENBECK	RECORDER 77-
14-064-19BCC	411005104355001	1210GLL	WSE	CH	C	77-	LARAMIE CO. WELL #9	RECORDER 77-
14-064-28BCC	410909104333301	1210GLL	WSE	CH	M	77-	ROESELER #1	
14-066-08BDC01	411152104481201	1210GLL	WSE	CH	Q	76-	HUGH LOWHAM	
14-066-10ABA	411210104452001	1210GLL	WSE	CH	C	77-	LARAMIE CO. WELL #8	RECORDER 77-
14-066-18BBD	411110104492601	1210GLL	CHEY	CH	Q	75-	SAM WEST	
14-066-21DDD	410938104462001	1210GLL	WSE	CH	W	76-		
14-067-06DAD	411231104553401	1210GLL	CHEY	CH	A	64-65,67-	JOHN BELL	
14-067-07CCB	411130104562701	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-067-07DCB	411131104555601	1210GLL	CHEY	CH	A	64-65,67-	CITY OF CHEYENNE	
14-067-18CBD	411050104562001	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-067-18DDC	411034104554001	1210GLL	CHEY	CH	C	56-	CITY OF CHEYENNE	RECORDER 72-
14-067-19BBD	411020104562701	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-067-31BBD	410834104562201	1210GLL	CHEY	CH	A	41-43,64,67-	MARK T. COX III	
14-067-31DDC	410755104554301	1210GLL	CHEY	CH	A	64-65,67-	ART KING	
14-068-10DCD	411124104591101	1210GLL	CHEY	CH	A	64-65,67-		
14-068-12DBC	411138104570501	1210GLL	CHEY	CH	A	65,67-	CITY OF CHEYENNE	
14-068-13ACB	411109104571001	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-068-13CCD	411032104573001	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
LARAMIE COUNTY	MISSOURI RIVER BASIN (continued)							
14-068-13DAD	411045104564201	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-068-14ADA	411107104574901	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-068-14CAD	411049104582301	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-068-14CBB	411050104584701	111ALVM	CHEY	CH	A	41-48,50-	CITY OF CHEYENNE	
14-068-14DCD	411035104580501	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-068-23DDC	410939104580101	1210GLL	CHEY	CH	A	40-47,49-	CITY OF CHEYENNE	
14-068-24BDD	411007104571801	1210GLL	CHEY	CH	A	56-	CITY OF CHEYENNE	
14-068-24DDD	410939104563601	1210GLL	CHEY	CH	A	50-53,55-62,64-	CITY OF CHEYENNE	
14-068-25ABB	410932104565601	1210GLL	CHEY	CH	A	41-42,50-51,64,70-	CITY OF CHEYENNE	
14-068-25DDA	410857104564401	1210GLL	CHEY	CH	A	41-	CITY OF CHEYENNE	
14-068-26BDD	410908104581801	1210GLL	CHEY	CH	A	42-43,45-47,68-69,71-	CITY OF CHEYENNE	
14-068-26CBC01	410901104585201	1210GLL	CHEY	CH	A	40-	CITY OF CHEYENNE	
14-068-27DCC	410848104592301	1210GLL	CHEY	CH	A	40,42-61,63-	CITY OF CHEYENNE	
14-068-28BCB02	410922105010402	1210GLL	CHEY	CH	A	64,68-	FRANCIS LIVESTOCK CO.	
14-068-28BDA	410921105004001	1210GLL	CHEY	CH	A	64-65,67-	FRANCIS LIVESTOCK CO.	
14-068-32DDC	410759105012201	1210GLL	CHEY	CH	A	48-	CITY OF CHEYENNE	
14-068-33ABC	410836105002801	1210GLL	CHEY	CH	A	47-	CITY OF CHEYENNE	
14-068-33DCC	410758105003501	1210GLL	CHEY	CH	A	45-48,50-	CITY OF CHEYENNE	
14-068-34AAB	410844104590601	1210GLL	CHEY	CH	A	40,42-	CITY OF CHEYENNE	
14-068-34DBD	410809104591901	1210GLL	CHEY	CH	A	43-48,50,69-	CITY OF CHEYENNE	
14-068-34DDD	410755104590001	1210GLL	CHEY	CH	A	44-48,50-	CITY OF CHEYENNE	
14-068-35CAC	410811104583501	1210GLL	CHEY	CH	A	45-	CITY OF CHEYENNE	
14-068-35CDD02	410757104582302	1210GLL	CHEY	CH	C	69-	CITY OF CHEYENNE	RECORDER 72-
14-068-36ACC	410825104571001	1210GLL	CHEY	CH	A	41-	CITY OF CHEYENNE	
14-068-36ADB	410833104565101	1210GLL	CHEY	CH	A	41-61,63-	CITY OF CHEYENNE	
14-068-36BCA	410832104573501	1210GLL	CHEY	CH	A	41-61,63-	CITY OF CHEYENNE	
15-060-18DBB	411557104074001	123BRUL	WSE	CH	M	71-	HENRY JESSEN	
15-061-03CCB	411727104113901	1210GLL	WSE	CH	M	77-	CHESTER BRUNS	
15-061-25CCC	411348104092301	123BRUL	WSE	CH	M	71-	USGS	
15-062-12DDD	411628104151401	1210GLL	WSE	CH	M	77-	EARL WOOLINGTON	
15-062-17BCC	411605104205201	1210GLL	WSE	CH	M	77-	MIKE PAVLICA	
15-062-20AAA	411531104194701	1210GLL	WSE	CH	C	77-	LARAMIE CO. WELL #4	RECORDER 77-
15-063-18DBD	411549104281001	1210GLL	WSE	CH	M	77-	ALICE PACE	
15-063-31BCC	411326104285801	1210GLL	WSE	CH	M	77-		
15-063-32BBC	411341104275201	1210GLL	WSE	CH	M	77-	MCDOWELL	
15-063-35CCD	411304104240801	1210GLL	WSE	CH	M	77-	ALEX PAVLICA	
15-066-10BAB	411725104454601	1210GLL	WSE	CH	C	77-	LARAMIE CO. WELL #7	RECORDER 77-
15-067-02DBA	411750104510901	1210GLL	WSE	CH	SA	61-	ERVIN H. MUELLER	
15-067-32DBA	411330104543701	1210GLL	CHEY	CH	A	42,50,53,64,67,69-	WARREN LIVESTOCK CO.	
15-069-06ACA	411808105094201	123BRUL	CHEY	CH	A	43-44,54-	CITY OF CHEYENNE	
15-069-09CAD	411655105073501	123BRUL	CHEY	CH	A	42-44,54-	CITY OF CHEYENNE	
15-069-16ACB	411621105072901	123BRUL	CHEY	CH	A	54-	CITY OF CHEYENNE	
15-069-21DCC	411452105072801	123BRUL	CHEY	CH	A	54-	CITY OF CHEYENNE	
15-069-27CDC	411406105063701	123BRUL	CHEY	CH	A	55-	CITY OF CHEYENNE	
15-069-28DBA	411425105071701	123BRUL	CHEY	CH	A	54-	CITY OF CHEYENNE	
15-069-33ABB	411359105072701	123BRUL	CHEY	CH	A	55-	CITY OF CHEYENNE	
15-069-34AAA	411355105055401	123BRUL	CHEY	CH	A	54-	CITY OF CHEYENNE	
16-060-07BBB	412227104081401	1210GLL	WSE	CH	C	75-	STATE ENGINEER	RECORDER 75-
16-060-10DBC	412155104040801	1210GLL	WSE	CH	M	76-	DON ANDERSON PETER #2	
16-060-27ABC	411941104041401	1210GLL	WSE	CH	M	72-	ANDERSON LIVESTOCK	

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
LARAMIE COUNTY	MISSOURI RIVER BASIN (continued)							
16-061-01CBA	412312104092001	121OGLL	WSE	CH	M	72-73,77-	ORVILLE LERURISH	
16-061-04DBB	412250104120901	121OGLL	WSE	CH	M	72-73,77-	LEONARD LUNDBERG	
16-061-08CCB	412147104135301	121OGLL	WSE	CH	M	77-	E. ZIMMERMAN	
16-061-14BBC	412126104102909	121OGLL	WSE	CH	M	64,74-	WARREN ANDERSON	
16-061-17AAA	411136104125301	121OGLL	WSE	CH	C	77-	LARAMIE CO. WELL #5	RECORDER 77-
16-061-30BBB	411952104150501	122ARKR	WSE	CH	SA	64-69,72-	FAYE MARQUISS	
16-062-14AAA	412134104162001	121OGLL	WSE	CH	M	72-	WARREN ANDERSON	
16-062-34CCC	411811104183501	122ARKR	WSE	CH	M	63-64,77-	KING CATTLE CO.	
16-063-26DDD02	411903104231902	122ARKR	WSE	CH	M	77-	ROBERT WISROTH	
16-064-03CCB	412238104322001	121OGLL	WSE	CH	M	53,64-70,72,74-	DAVID JOHNSON	
16-065-21DBC	412015104394301	121OGLL	WSE	CH	M	53,64-65,77-		
17-060-20ADA02	412542104053202	122ARKR	WSE	CH	M	72-	JOHN W. FREEBURG	
17-060-30DAD	412429104064101	121OGLL	WSE	CH	M	72-	RICHARD R. LARSON	
17-060-33CBB	412343104053101	121OGLL	WSE	CH	C	75-	STATE ENGINEER	RECORDER 75-
17-060-34CBB	412346104041801	121OGLL	WSE	CH	M	72-	ED P. ANDERSON	
17-061-26AAC	412456104084501	121OGLL	WSE	CH	M	77-	MIKE & BRUCE PETERSON	
17-062-20CCC	412507104133701	121OGLL	WSE	CH	C	77-	LARAMIE CO. WELL #6	RECORDER 77-
17-062-26AAA	412505104160301	121OGLL	WSE	CH	M	53,64-70,72-	STOCKGROWERS BANK	
17-062-28BCC	412456104470901	121OGLL	WSE	CH	M	72-	GEORGE ROMSA	
17-062-31ACC02	412350104211002	122ARKR	WSE	CH	M	77-	LAZY JR LAND & LIVESTOCK	CO.
17-063-26DBA02	412433104230802	122ARKR	WSE	CH	M	77-	LAZY JR LAND & LIVESTOCK	CO.
18-066-31CCC	412853104493001	122ARKR	USGS	CH	SA	63-	HAROLD LEWIS	
LINCOLN COUNTY	GREEN RIVER BASIN							
21-114-26BCC 1	414619110193301	124LNEY	WSE	GR	SA	65-	STATE OF WYOMING	
24-112-08CBB	420430110191901	124LNEY	WSE	GR	SA	66-70,72-	NATIONAL PARK SERVICE	
LINCOLN COUNTY	BEAR RIVER BASIN							
22-119-05CDA	415442110571801	111TRRC	WSE	GR	SA	59,62-	DOYLE KNOUSE	
23-119-32BDA02	415552110571502	111TRRC	WSE	GR	SA	62-	THORNOCK BROS.	
23-120-13AAC	415849110590801	111ALVM	WSE	GR	SA	55-	DOYLE KNOUSE	
24-119-28ACA	420202110555501	111TRRC	WSE	GR	SA	62-	HERMAN TEICHERT	
NATRONA COUNTY	MISSOURI RIVER BASIN							
30-085-21BAB	423346107014201	122ARKR	WSE	C	SA	67-		
31-081-18AAB	423938106350301	111ALVM	WSE	C	SA	66-	J. H. RISSLER	
33-077-03BDC	425131106042801	111ALVM	WSE	C	SA	66-	JOHN PIERCE	
33-080-04ABB	425147106263701	111TRRC	WSE	C	SA	50,65-	USBR	
34-080-08CCC	425517106282501	111TRRC	WSE	C	SA	67-	USGS	
35-080-31DDD	425700106282801	111TRRC	WSE	C	SA	67-	USGS	
40-078-15AAB	432633106115201	211FXHL	WSE	C	SA	65-	TOWN OF EDGERTON	
NIOBRARA COUNTY	MISSOURI RIVER BASIN							
31-060-15DA	423940104031201	122ARKR	WSE	CH	SA	62-	USGS	
31-061-29BB	423816104131501	122ARKR	WSE	CH	SA	72-	ROBERT HOLMES	
31-062-18DC		122ARKR	WSE	CH	SA	73,75-	GORDAN KAAN	

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
NIOBRARA COUNTY	MISSOURI RIVER BASIN (continued)							
32-060-29BC	424323104060301	122ARKR	WSE	CH	SA	56,72-	A. F. LARSON	
32-062-05BAA	424709104194101	122ARKR	WSE	S	C	79-	STATE ENGINEER	RECORDER 79-
32-062-12CCD	424532104153001	122ARKR	WSE	CH	SA	72-	KEN FREEMAN	
32-062-20BDD	424410104195401	122ARKR	WSE	CH	SA	58,68,70-	KOEL LARSEN	
32-062-32BBB	424244104202001	122ARKR	WSE	C	C	70-	RICHARD PFISTER	RECORDER 70-
32-063-02CCC	424623104234601	122ARKR	WSE	CH	SA	52,59,68-	G. CHRISTIAN	
32-063-08DAA	424544104260601	122ARKR	WSE	S	C	79-	STATE ENGINEER	RECORDER 79-
32-063-33BBB	424232104261001	122ARKR	WSE	CH	SA	57,60-	EARL QUIBLEY	
32-064-24DA 02	424355104290202	122ARKR	WSE	CH	SA	60-	IRA LAMB	
33-061-34BDC		122ARKR	WSE	CH	SA	75-	STATE OF WYOMING	
33-062-29DBA	424801104203101	122ARKR	WSE	CH	SA	67-74,76-	DALE FALLERTON	
36-062-28AB 01	430422104183201	331MDSN	WSE	C	C	74-	ENERGY TRANS. CO.	RECORDER 74-
36-062-28AB 02	430422104183202	217LKOT	WSE	C	C	74-	ENERGY TRANS. CO.	RECORDER 75-
40-061-21BAB	432611104114801	111ALVM	WSE	C	SA	70-	USGS	
PLATTE COUNTY	MISSOURI RIVER BASIN							
21-065-16AAA	414755104391101	122ARKR	USGS	CH	SA	72-	HELLBAUM	
23-068-15DDD	415733104585601	122ARKR	WSE	CH	Q	58-70,72,74-	WPRS	
23-068-18DAD	415749105022501	122ARKR	WSE	CH	Q	58-70,72-	WPRS	
24-067-21AAB	420237104532101	111ALVM	WSE DEPD	P	C	79-	ED PREUIT	RECORDER 79-
24-068-03DAD	420441104585801	122ARKR	WSE	CH	Q	58-70,72-	WPRS	
25-067-19DDA01	420718104553901	122ARKR	WSE DEPD	P	C	79-	ED WILHELM	RECORDER 79-
25-068-31AAA	420613105024401	122ARKR	WSE DEPD	P	C	79-	ERNIE DOUGLAS	RECORDER 79-
28-068-17CBC	422355105023801	122ARKR	WSE	CH	Q	61-70,72-	W. H. JOHNSON	
SHERIDAN COUNTY	MISSOURI RIVER BASIN							
53-083-07ADC	443450106534801	124WSTC	WSE	B	SA	60-	MR. PRATHER	
54-081-14BC02	443915106352201	124WSTC	WSE	B	SA	60-	ULM SCHOOL	
SUBLETTE COUNTY	GREEN RIVER BASIN							
28-112-19AC01	422348110114501	124WSTC	WSE	GR	SA	65-70,72-	BLM	
30-107-06DD01	423540109382001	124WSTC	WSE	GR	SA	64-66,68-	BLM	
30-111-17ACA01	423504110053001	124WSTC	WSE	GR	SA	65-	SUBLETTE COUNTY	
32-108-05BA	424624109450201	111ALVM	WSE	GR	SA	65-	JAMES BARGER	
35-111-08ADB	430118110071001	111ALVM	WSE	GR	SA	65-	USGS	
SWEETWATER COUNTY	GREEN RIVER BASIN							
18-110-21DBA01	413128109495801	111ALVM	WSE	GR	SA	64-	R. E. HOLDING	
19-095-05DD	413902108070601	124WSTC	WSE	GR	SA	72-	MR. JOLLEY	
19-099-06DCC	413850108362501	125FRUN	WSE	GR	SA	63-	ROCK SPGS GRAZING ASSOC.	
20-100-25DCD	414035108442001	211ALMD	WSE	GR	SA	63-	USGS	
22-105-07AAD	415402109203601	124LNEY	WSE	GR	SA	64-	SHEEP CO.	
25-106-27CCD	420615109265201	124LNEY	WSE	GR	SA	65-	TOWN OF FARSON	

Table 2. Ground-water stations (continued)

WELL NUMBER	LAT-LONG-SEQ NO	GEO-LOGIC UNIT	FUNDING AGENCY	FIELD OFFICE	FREQUENCY OF OBSERVATION	PERIOD OF RECORD	NAME OF OWNER	REMARKS
UINTA COUNTY	GREEN RIVER BASIN							
15-115-20CBA	411549110243501	111TRRC	WSE	GR	SA	57-		
15-118-24BCB	411607110404201	124WSTC	WSE	GR	SA	64-	SCHOOL DISTRICT	
UINTA COUNTY	BEAR RIVER BASIN							
16-121-11ACC	412249111015801	111TRRC	WSE	GR	SA	55-	ELWIN SESSIONS	
WESTON COUNTY	MISSOURI RIVER BASIN							
42-066-14ADC01	433710104443501	211FXHL	USGS	P	SA	74-		
42-066-36CD01	433415104435001	211LNCE	USGS	P	SA	76-	TRUE OIL CO.	
45-061-33AB	435030104110001	337PHSP	WSE	CH	A	75-	SLAGLE RANCH	
46-061-29BAC	435628104123401	337PHSP	WSE	C	SA	69-	CORONADO CO.	
46-063-09DB	435840104253001	217LKOT	WSE	C	Q	69-	FARELLA BROS.	
46-066-25DBB	435610104433001	331MDSN	WSE	CH	A	62,75-	BLACK HILLS POWER & LIGHT	
47-060-04ADA	440500104034001	337PHSP	WSE	SD	M	72,75-	TERRA RESOURCES	
48-065-35CBC	440645104365601	337PHSP	WSE	O	M	76-	WESTON COUNTY	
48-065-35CCB	440530104381001	337PHSP		O	M	61-	TOWN OF UPTON UPTON #4	

Water-quality stations

Explanation of abbreviations and codes used in table 3.

Period of Record: The dates given are the calendar years in which records began or ended. Breaks of less than a year are not shown.

Location:
SE, section
TSP, township
RNGE, range

Funding Agency:
BIA, Bureau of Indian Affairs
BLM, Bureau of Land Management
EPA, Environmental Protection Agency, Region 8
MRB, Geological Survey, Missouri River Basin Program
USGS, Geological Survey, Federal Program
WDA, Wyoming Department of Agriculture
WDEQ, Wyoming Department of Environmental Quality
WPUC, Water and Power Resources Service, Upper Colorado Region

Sampling Frequency:
C, continuous (recorder)
D, daily
BW, biweekly
M, monthly
MW, monthly, except weekly during irrigation season
MQ, monthly during summer, quarterly during winter
Q, quarterly
HL, high and low flow samples only
SA, semiannual
I, infrequent or as requested

Analysis Schedule:
1, salinity (major constituents)
2, specific conductance
3, daily temperature (observed)
4, bacteria or chemical oxygen demand
5, field determinations of: pH, specific conductance, dissolved oxygen, temperature, and (or) turbidity
6, total coliform, fecal coliform, and (or) fecal streptococcus
7, nutrient
8, trace metals
9, pesticides
10, radiochemical
11, biological
12, miscellaneous

Field Office:
C, Casper
CF, Cheyenne Field Unit
CH, Cheyenne Hydrologic Surveillance Section
CT, Contractor
GR, Green River
M, Montana
R, Riverton
S, Wyoming State Engineer
W, Worland

Table 3. Water-quality stations

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
YELLOWSTONE RIVER BASIN											
@06207500	CLARKS FORK YELLOWSTONE RIVER NEAR BELFRY, MT	1154	1965-	31	9S	22E	WDA	M	1	W	
#@06207510	BIG SAND COULEE AT WYOMING-MONTANA STATE LINE	134	1976-	32	9S	22E	BLM	Q	1,5,7,	W	
@06218500	WIND RIVER NEAR DUBOIS	232	1947-50, 1965-	25	42N	108W	WDA	M	1	R	
							WDEQ	M	5,6	R	
							WDA	HL	9	R	
#@06220500	EAST FORK WIND RIVER NEAR DUBOIS	427	1975-	34	6N	6W	MRB	M	5	R	
@06222700	CROW CREEK NEAR TIPPERARY	30.2	1974-	20	7N	4W	MRB	M	5	R	
@06224000	BULL LAKE CREEK ABOVE BULL LAKE	187	1974-	2	2N	4W	MRB	M	5	R	
@06228000	WIND RIVER AT RIVERTON	2309	1947-50, 1953, 1965-	2	1S	4E	WDA	M	1	R	
@06228350	SF LITTLE WIND R AB WASHAKIE RE NR FT WASHAKIE		1976-	18	1S	2W	MRB	M	1,5	R	
@06231000	LITTLE WIND RIVER ABOVE ARAPAHOE	660	1966-	23	1S	3E	WDA	M	1	R	
@06233900	POPO AGIE RIVER NEAR ARAPAHOE		1979-	27	1S	3E	BIA	M	1	R	
06235000	BEAVER CREEK NEAR ARAPAHOE	354	1967-	29	1S	4E	WDA	M	1	R	
@06235500	LITTLE WIND RIVER NEAR RIVERTON	1904	1965-	11	15N	4E	WDA	M	1	R	
06236100	WIND RIVER ABOVE BOYSEN RESERVOIR, NR SHOSHONI	4390	1974-	25	2N	5E	WDEQ	M	1,5,6	R	
							WDA	HL	9	CH	
@06246500	OCEAN DRAIN AT OCEAN LAKE OUTLET, NR PAVILLION		1978-				MRB	M	1,5	R	
#@06253000	FIVEMILE CREEK NEAR SHOSHONI	418	1949-51, 1953, 1965-	19	3N	6E	WDA	M	1	R	
							MRB	M	1,5	R	
#@06256900	DRY CREEK NEAR BONNEVILLE	52.6	1976-	8	38N	92W	BLM	M	1,5	R	
#@06259000	WIND RIVER BELOW BOYSEN RESERVOIR	7701	1953-54, 1960-	9	5N	6E	WDA	D	2,3	CH	
							WDA	M	1	R	
							WDEQ	M	5,6	R	
							WDA	HL	9	CH	
							EPA	Q	10	R	
							EPA	HL	8	R	
@06260000	SOUTH FORK OWL CREEK NEAR ANCHOR	85.5	1974-	28	43N	100W	MRB	M	5	W	
@06260400	SOUTH FORK OWL CREEK BELOW ANCHOR RESERVOIR	131	1974-	25	43N	100W	MRB	M	5	W	
06264700	BIGHORN RIVER AT LUCERNE	-	1966-	32	44N	94W	WDA	M	1	W	
							WDEQ	M	5,6	W	
#@06267400	EAST FORK NOWATER NEAR COLTER	149	1977-	31	46N	92W	BLM	Q	1,5,6	W	
							BLM	HL	7,8	W	
#06267900	MIDDLE FORK FIFTEENMILE CREEK NEAR WORLAND		1979-	2	47N	95W	BLM	Q	1,5,6	W	
#@06268500	FIFTEENMILE CREEK NEAR WORLAND	518	1962-72, 1979-	27	47N	93W	BLM	Q	1,5,6	W	
06268600	BIGHORN RIVER AT WORLAND	10810	1966-	25	47N	93W	WDA	M	1	W	
#@06270000	NOWOOD RIVER NEAR TEN SLEEP	803	1967-	27	47N	88W	WDA	M	1	W	
06273500	PAINT ROCK CREEK NEAR MOUTH, BELOW HYATTVILLE	376	1951-53, 1967-	19	49N	90W	WDA	M	1	W	
06274220	NOWOOD RIVER AT MANDERSON	2000	1965-	30	50N	92W	WDA	M	1	W	
06277500	GREYBULL RIVER NEAR BASIN	1115	1951-53, 1965-	8	51N	94W	WDA	M	1	W	
							WDA	HL	9	W	
@06278000	DRY CREEK NEAR GREYBULL		1979-	7	52N	94W	BLM	Q	1,5,6	W	
06279090	SHELL CREEK NEAR GREYBULL	560	1951, 1965-	4	52N	93W	WDA	M	1	W	
#@06279500	BIGHORN RIVER AT KANE	15765	1947-53, 1955-57,	9	55N	94W	WDA	M	1	W	
							WDEQ	M	5,6	W	
			1960-				WDA	HL	9	CH	

Also sediment station.
@ Also surface-water station.

Table 3. Water-quality stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
				SE	TSP	RNGE					
YELLOWSTONE RIVER BASIN (continued)											
@06282000	SHOSHONE RIVER BELOW BUFFALO BILL RESERVOIR	1538	1947-49,	3	52N	102W	WDA	M	1	W	
			1964-				WDA	HL	9	W	
06282900	SHOSHONE RIVER ABOVE DRY CREEK, NEAR CODY	-	1974-	13	53N	101W	WDEQ	M	1,5,6	W	
@06284500	BITTER CREEK NEAR GARLAND	80.5	1958-60,	7	55N	97W	MRB	D	2,3	CH	
			1969-				MRB	M	1,7	W	
@06284800	WHISTLE CREEK NEAR GARLAND	101	1959-60,	30	55N	97W	MRB	D	2,3	CH	
			1969-				MRB	M	1,7	W	
#@06285100	SHOSHONE RIVER NEAR LOVELL	2350	1966-	16	56N	96W	MRB	D	2,3	CH	
							MRB	M	1,7	W	
							WDEQ	M	5,6	W	
@06285400	SAGE CREEK AT SIDON CANAL, NEAR DEAVER	341	1958-60,	34	57N	97W	MRB	D	2,3	CH	
			1969-				MRB	M	1,7	W	
06286200	SHOSHONE RIVER AT KANE	2989	1976-	6	56N	95W	WDA	HL	9	CH	
@06298000	TONGUE RIVER NEAR DAYTON	204	1966-	11	56N	87W	WDA	M	1	CH	
06299980	TONGUE RIVER AT MONARCH	-	1973-	20	57N	84W	EPA	M	1,4,5,6,7	CH	
							EPA	HL	8	CH	
06304500	LITTLE GOOSE CREEK NEAR SHERIDAN	159	1979-	27	56N	84W	WDEQ	M	1,5,6,7	CH	
#@06305500	GOOSE CREEK BELOW SHERIDAN	392	1959-60,	15	56N	84W	WDA	M	1	CH	
			1961-64,				WDEQ	M	5,6	CH	
			1967-				EPA	M	4,6,7	CH	
							EPA	HL	8	CH	
06306300	TONGUE RIVER AT STATE LINE, NEAR DECKER, MT	1477	1965-	33	9S	40E	WDA	M	1	M	
							WDEQ	M	5,6	M	
							EPA	HL	8	M	
@06312500	POWDER RIVER NEAR KAYCEE	980	1968-	13	43N	81W	WDA	M	1	CH	
							WDEQ	M	5,6	CH	
@06313000	SOUTH FORK POWDER RIVER NEAR KAYCEE	1150	1968-	9	42N	81W	WDA	M	1	CH	
							WDEQ	M	5,6	CH	
#@06313400	SALT CREEK NEAR SUSSEX	769	1967-	8	42N	79W	WDA	M	1	C	
							USGS	M	4,5,7	C	
							USGS	Q	8	C	
#@06313500	POWDER RIVER AT SUSSEX	3090	1949-53,	13	43N	79W	USGS	M	1,5,6,7	CT	
			1977-				USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06316400	CRAZY WOMAN CREEK AT UPPER STATION, NEAR ARVADA	945	1966-	18	52N	77W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
@06317000	POWDER RIVER AT ARVADA	6050	1946-53,	21	54N	77W	WDA	M	1	CH	
			1967-				WDEQ	Q	5,6	CH	
#@06320200	CLEAR CREEK BELOW ROCK CREEK, NEAR BUFFALO	322	1975-	30	51N	81W	USGS	M	1,4,5,7	CH	
							USGS	Q	8	CH	
#@06320400	CLEAR CREEK AT UCROSS	409	1975-	19	53N	80W	USGS	M	1,4,5,7	CH	
							USGS	Q	8	CH	
@06323500	PINEY CREEK AT UCROSS	267	1975-	18	53N	80W	EPA	M	1,5,6,7	CH	
							EPA	HL	8	CH	
#@06324000	CLEAR CREEK NEAR ARVADA	1110	1950-54,	36	57N	77W	WDA	M	1	CH	
			1966-				EPA	M	5,6,7	CH	
							EPA	HL	8	CH	
#@06324500	POWDER RIVER AT MOORHEAD, MT	8088	1976-	8	9S	46E	WDA	HL	9	B	

# Also sediment station.
@ Also surface-water station.

Table 3. Water-quality stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
				SE	TSP	RNGE					
YELLOWSTONE RIVER BASIN (continued)											
#@06324890	LITTLE POWDER R BELOW CORRAL C NEAR WESTON		1975-	12	52N	72W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06324925	LITTLE POWDER RIVER NEW WESTON		1976-	19	54N	70W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06324970	LITTLE POWDER RIVER ABOVE DRY CREEK, NR WESTON	1230	1975-	13	57N	71W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
CHEYENNE RIVER BASIN											
#@06364700	ANTELOPE CREEK NEAR TECKLA		1977-	35	41N	70W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06365300	DRY FORK CHEYENNE RIVER NEAR BILL	128	1976-	31	38N	73W	BLM	M	1,4,5,7,8	C	SAMPLE WHEN FLOW
#@06365900	CHEYENNE RIVER NEAR DULL CENTER	1527	1975-	20	40N	68W	USGS	M	1,4,5,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06375600	LITTLE THUNDER CREEK NEAR HAMPSHIRE		1977-	33	43N	67W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06376300	BLACK THUNDER CREEK NEAR HAMPSHIRE	535	1979-	31	42N	65W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06378300	LODGEPOLE CREEK NEAR HAMPSHIRE		1977-	5	41N	64W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06386000	LANCE CREEK NEAR RIVERVIEW	2070	1975-	14	39N	62W	USGS	M	1,4,5,7	C	
							USGS	Q	8	C	
06386500	CHEYENNE RIVER NEAR RIVERVIEW	5270	1975-	25	40N	61W	EPA	M	1,5,6,7	C	
							EPA	Q	10	C	
							EPA	ML	8	C	
@06394000	BEAVER CREEK NEAR NEWCASTLE	1320	1949-53, 1967-	18	41N	60W	WDA	M	1	C	
#@06425720	BELLE FOURCHE RIVER BL RATTLESNAKE CR, NR PINEY	495	1975-	9	46N	71W	USGS	-	1,4,5,7,8	CH	SAMPLE WHEN FLOW
#@06425750	COAL CREEK NEAR PINEY	-	1980-	12	46N	71W	USGS	M	1,4,5,7,5	CH	
#@06425780	BELLE FOURCHE RIVER ABOVE DRY CREEK, NEAR PINEY	594	1975-	25	47N	71W	USGS	-	1,4,5,7,8	CH	SAMPLE WHEN FLOW
#@06425900	CABALLO CREEK AT MOUTH, NEAR PINEY		1977-	4	47N	70W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06425950	RAVEN CREEK NEAR MOORCROFT		1977-	1	48N	69W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	

# Also sediment station.
@ Also surface-water station.

Table 3. Water-quality stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
CHEYENNE RIVER BASIN (continued)											
#@06426400	DONKEY CREEK NEAR MOORCROFT		1977-	30	50N	68W	USGS	M	1,5,6,7	CT	
							USGS	M	11	CT	
							USGS	Q	8	CT	
							USGS	SA	10	CT	
#@06426500	BELLE FOURCHE RIVER BELOW MOORCROFT	1670	1975-	24	50N	68W	EPA	M	1,4,5,6,7	C	
							BLM	M	1,4,5,7	C	
							EPA	HL	8	C	
							BLM	HL	8	C	
06427850	BELLE FOURCHE RIVER AT DEVILS TOWER	-	1967-	7	53N	65W	WDA	M	1	C	
06428500	BELLE FOURCHE R AT WYO-SOUTH DAKOTA STATE LINE	3280	1965-	18	9N	1E	WDA	M	1	C	
							WDEQ	M	5,6	C	
							EPA	M	6,7	C	
							EPA	HL	8	C	
PLATTE RIVER BASIN											
@06620000	NORTH PLATTE RIVER NEAR NORTHGATE, CO	1431	1965-	11	11N	80W	WDA	M	1	CF	
							WDEQ	M	5,6	CH	
							WDA	HL	9	CH	
#@06623800	ENCAMPMENT RIVER AB HOG PARK CR, NR ENCAMPMENT	72.7	1967-	10	12N	84W	USGS	M	1,5,6,7	CF	
							USGS	HL	8,9	CF	
							USGS	A	10	CF	
@06625000	ENCAMPMENT RIVER AT MOUTH, NEAR ENCAMPMENT	265	1965-	3	15N	83W	WDA	M	1	CH	
#@06628800	SAGE CREEK NEAR SARATOGA	263	1972-	32	19N	85W	BLM	M	1	CF	NO WINTER SAMPLE
@06630000	NORTH PLATTE RIVER AB SEMINOE RES, NR SINCLAIR	8134	1960-	13	22N	86W	WDA	M	1	CH	
							WDEQ	M	5,6	CH	
							WDA	HL	9	CH	
#@06630300	BIG DITCH NEAR COYOTE SPRINGS	110	1974-	30	23N	83W	BLM	M	1,5,7	CF	
							BLM	Q	8	CF	
							BLM	A	10	CF	
#@06630330	NORTH DITCH NEAR COYOTE SPRINGS	22.6	1976-	19	23N	83W	BLM	M	1,5,7	CF	
							BLM	Q	8	CF	
							BLM	A	10	CF	
#@06634600	LITTLE MEDICINE BOW RIVER NEAR MEDICINE BOW	966	1965-	21	23N	78W	WDA	M	1	CF	
							EPA	Q	10	CF	
							EPA	HL	8	CF	
#@06634990	HANNA DRAW NEAR HANNA	21.6	1974-	34	24N	81W	BLM	M	1,5,7,	CF	
							BLM	Q	8	CF	
							BLM	A	10	CF	
#@06635000	MEDICINE BOW RIVER ABOVE SEMINOE RES, NR HANNA	2338	1965-	34	24N	81W	WDA	M	1	CF	
							EPA	Q	10	CF	
							EPA	HL	8	CF	
06636000	NORTH PLATTE RIVER ABOVE PATHFINDER RESERVOIR	7241	1969-	34	26N	84W	MRB	M	5	C	
#@06639000	SWEETWATER RIVER NEAR ALCOVA	2727	1964-	25	29N	87W	WDA	M	1	C	
							WDEQ	M	5,6	C	
							EPA	Q	10	C	
							EPA	HL	8	C	
#@06642000	NORTH PLATTE RIVER AT ALCOVA	10812	1965-	17	30N	82W	WDA	M	1	C	
							WDEQ	M	5,6	C	
06643000	BATES CREEK NEAR ALCOVA	393	1970-	1	31N	82W	MRB	M	5	C	
06643510	NORTH PLATTE R AB POISON SPIDER C NR GOOSE EGG		1977-	3	32N	81W	EPA	BW	5,6,7	C	
							EPA	M	8	C	
							EPA	Q	1,10	C	
							WDEQ	M	4	C	

# Also sediment station.
@ Also surface-water station.

Table 3. Water-quality stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
PLATTE RIVER BASIN (continued)											
06644085	NORTH PLATTE RIVER AT MILLS	-	1970-	7	33N	79W	MRB	MW	5	C	
06644500	CASPER CREEK AT CASPER	668	1970-	7	33N	79W	MRB	MW	5	C	
							MRB	A	1	C	
#06644550	NORTH PLATTE RIVER AT CASPER	-	1971-	4	33N	79W	MRB	MW	5	C	
06645000	NORTH PLATTE RIVER BELOW CASPER	12574	1950-52, 1957-59, 1967-	4	33N	78W	WDA	M	1	C	
							WDEQ	BW	4,5,6	C	
@06646600	DEER CREEK BELOW MILLAR WASTEWAY, AT GLENROCK	213	1967-	4	33N	75W	WDA	M	1	C	
#@06646780	SAND CREEK NEAR GLENROCK		1977-	5	33N	74W	USGS	M	1,5,6,7	C	
							USGS	M	11	C	
							USGS	Q	8	C	
							USGS	SA	10	C	
@06646800	NORTH PLATTE RIVER NEAR GLENROCK	13538	1960-	17	33N	74W	WDA	M	1	C,S	
#@06652000	NORTH PLATTE RIVER AT ORIN	14888	1966-	17	31N	69W	WDA	M	1	C	
							WDEQ	M	5,6	C	
							EPA	Q	10	C	
							EPA	HL	8	C	
@06652800	NORTH PLATTE RIVER BELOW GLENDO RESERVOIR	15548	1966-	30	29N	67W	WDA	M	1	CH	
							WDEQ	M	5,6	CH	
@06656000	NORTH PLATTE RIVER BELOW GUERNSEY RESERVOIR	16237	1950-58, 1965-	27	27N	66W	WDA	M	1	CH	
06660100	LARAMIE RIVER AT HOWELL	-	1974-	30	17N	73W	WDEQ	M	1,5,6	CH	
06660500	LARAMIE RIVER AT TWO RIVERS	1224	1966-	5	17N	74W	WDA	M	1	CH	
06661500	LITTLE LARAMIE RIVER AT TWO RIVERS	376	1965-	6	17N	74W	WDA	M	1	CH	
@06662000	LARAMIE RIVER NEAR LOOKOUT	2174	1976-	27	21N	74W	WDA	HL	9	CH	
#@06670500	LARAMIE RIVER NEAR FORT LARAMIE	4495	1965-	25	26N	65W	WDA	M	1	CH	
							WDEQ	M	5,6	CH	
							WDA	HL	9	CH	
#@06674500	NORTH PLATTE R AT WYOMING-NEBRASKA STATE LINE	22218	1965-	4	23N	58W	WDA	M	1	CH	
							WDEQ	M	5,6	CH	
@06679500	NORTH PLATTE RIVER AT MITCHELL, NE	24300	1976-	33	33N	56W	WDA	HL	9	CH	
GREEN RIVER BASIN											
@09188500	GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL	468	1962-64, 1967-73, 1974-	8	35N	111W	WDEQ	M	1,5,6	GR	
09192600	GREEN RIVER NEAR BIG PINEY	-	1967-	21	30N	110W	WDA	M	1	GR	
@09205000	NEW FORK RIVER NEAR BIG PINEY	1230	1965-	22	30N	110W	WDA	M	1	GR	
#@09209400	GREEN RIVER NEAR LABARGE	3910	1963-	33	26N	112W	WDA	M	1	GR	
							WDEQ	M	5,6	GR	
							EPA	M	1,5,6,7	GR	
							WDA	HL	9	GR	
							EPA	HL	8	GR	
@09211200	GREEN RIVER BELOW FONTENELLE RESERVOIR	4280	1967-	31	24N	111W	WDA	M	1	GR	
							WDEQ	M	5,6	GR	
							EPQ	M	1,5,6,7	GR	
							EPQ	HL	8	GR	
#@09214500	LITTLE SANDY CREEK ABOVE EDEN	134	1976-	11	26N	105W	BLM	M	1,5	GR	
							BLM	Q	7	GR	
							BLM	A	8	GR	

# Also sediment station.
@ Also surface-water station.

Table 3. Water-quality stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
GREEN RIVER BASIN (continued)											
#@09216000	BIG SANDY RIVER BELOW EDEN	1610	1961-64, 1967-	31	24N	107W	WDA	M	1	GR	
							EPA	M	1,5,6,7	GR	
							EPA	HL	8	GR	
							WDA	HL	9	GR	
09216300	GREEN RIVER AT BIG ISLAND, NEAR GREEN RIVER	-	1966-	26	21N	109W	WDA	M	1	GR	
#@09216527	SEPARATION CREEK NEAR RINER	55.3	1975-	32	20N	90W	BLM	M	1,4,5,7	CH	
							BLM	Q	8	CH	
#@09216545	BITTER CREEK NEAR BITTER CREEK	308	1975-	36	18N	99W	USGS	M	1,4,5,7	GR	
							USGS	Q	8	GR	
#@09216562	BITTER CREEK AB SALT WELLS CREEK, NR SALT WELLS	836	1975-	2	19N	103W	BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
#@09216565	SALT WELLS CREEK NEAR SOUTH BAXTER	-	1975-	15	14N	103W	BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
#09216578	DRY CANYON CREEK NEAR SOUTH BAXTER	3.69	1976-	5	14N	102W	BLM	M	5	GR	
#@09216750	SALT WELLS CREEK NEAR SALT WELLS	526	1975-	14	19N	103W	BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
							BLM	D	2,3	GR	
09216810	KILLPECKER CREEK AT ROCK SPRINGS	-	1975-	26	19N	105W	EPA	M	1,5,6,7	GR	
							EPA	HL	8	GR	
09216880	BITTER CREEK BEL LITTLE BITTER CREEK, NR KANDA	-	1975-	7	18N	105W	EPA	M	1,5,6,7	GR	
							EPA	HL	8	GR	
#@09217000	GREEN RIVER NEAR GREEN RIVER	14000	1951-	26	18N	107W	USGS	D	2,3	GR	
							USGS	M	1	GR	
							WDEQ	M	5,6	GR	
							EPA	M	1,5,6,7	GR	
							EPA	HL	8	GR	
09217010	GREEN RIVER BELOW GREEN RIVER	-	1973-	36	18N	107W	WDEQ	M	1,5,6	GR	
							EPA	M	1,4,5,6,7	GR	
							EPA	HL	8	GR	
							WDA	HL	9	GR	
09221650	SMITHS FORK NEAR LYMAN	-	1974-	12	16N	114W	WDEQ	M	1,5,6	GR	
#@09222000	BLACKS FORK NEAR LYMAN	821	1962-	15	17N	113W	WPUC	D	2,3	GR	
							WPUC	M	1,5,6	GR	
							WDEQ	M	5,6	GR	
#@09222300	LITTLE MUDDY CREEK NEAR GLENCOE	416	1975-	31	19N	116W	BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
#@09222400	MUDDY CREEK NEAR HAMPTON	963	1975-	18	18N	113W	BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
09224050	HAMS FORK NEAR DIAMONDVILLE	-	1975-	36	21N	116W	EPA	M	1,4,5,6,7	GR	
							EPA	HL	8	GR	
#09224450	HAMS FORK NEAR GRANGER	670	1965-	30	19N	111W	WDA	M	1	GR	
#@09224700	BLACKS FORK NEAR LITTLE AMERICA	3100	1951-	15	18N	109W	USGS	D	2,3	GR	
							USGS	M	1	GR	
							WDEQ	M	5,6	GR	
							WDA	HL	9	GR	
#@09235300	VERMILLION CREEK NEAR HIAWATHA, CO	196	1975-	15	12N	100W	BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
09253000	LITTLE SNAKE RIVER NEAR SLATER, CO	285	1978-	15	12N	87W	WDA	M	1,5	CO	
09259700	LITTLE SNAKE RIVER NEAR BAGGS	3020	1979-	5	12N	91W	WDA	M	1,5	CO	

# Also sediment station.
@ Also surface-water station.

Table 3. Water-quality stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			FUNDING AGENCY	SAMPLING FREQUENCY	ANALYSIS SCHEDULE	FIELD OFFICE	REMARKS
				SE	TSP	RNGE					
BEAR RIVER BASIN											
@10020100	BEAR RIVER ABOVE RESERVOIR, NEAR WOODRUFF, UT	752	1968-	29	17N	120W	WDA	M	1	GR	
							WDEQ	M	5,6	GR	
#@10027000	TWIN CREEK AT SAGE	246	1967-69, 1975-	7	21N	119W	EPA	M	1,5,6,7	GR	
							EPA	HL	8	GR	
							BLM	M	1,4,5,7	GR	
							BLM	Q	8	GR	
@10039500	BEAR RIVER AT BORDER	2490	1965-	15	14S	46E	WDA	HL	9	GR	
							USGS	M	9	GR	
							USGS	D	2,3	GR	
							USGS	M	1,5,6,7	GR	
							USGS	HL	8	GR	
							USGS	I	11	GR	
SNAKE RIVER BASIN											
#@13018300	CACHE CREEK NEAR JACKSON	10.6	1965-	1	40N	116W	USGS	M	1,5,6,7	GR	
							USGS	HL	8,9	GR	
							USGS	A	10	GR	
@13022500	SNAKE RIVER ABOVE RESERVOIR, NEAR ALPINE	3465	1965-	-	-	-	WDA	M	1	GR	
							WDEQ	M	5,6	GR	
@13027500	SALT RIVER ABOVE RESERVOIR, NEAR ETNA	829	1965-	28	36N	119W	WDA	M	1	GR	
							WDEQ	M	5,6	GR	
							WDA	HL	9	GR	

# Also sediment station.
@ Also surface-water station.

Sediment stations

Explanation of abbreviations and codes used in table 4.

Period of Record: The dates given are the calendar years in which records began or ended. Breaks of less than a year are not shown.

Location:
SE, section
TSP, township
RNGE, range

Sampling Equipment:
H, hydrographer sample
O, observer sample
P, pumping sampler
S, single-stage samplers

Suspended Sediment Sampling Frequency:
1, samples collected by observer once daily during operation except during periods of rapidly changing flow when additional samples are collected.
2, sampled by hydrographer at least once a month all year, with additional samples collected during periods of rapidly changing flow.
3, sampled by hydrographer at least once a month during open-water period and at least twice during extended periods of ice cover.
4, sampled by hydrographer at least once a month Apr.-Sept.
5, samples collected by Water and Power Resources Services weekly during irrigation season.
6, pumping sampler serviced monthly or more often during periods of high runoff.
7, single-stage sampler serviced at least monthly. Samples collected by hydrographer if there is flow at time of visit.
8, infrequent sampling, sample when visiting station operated by WSE personnel.
9, sampled quarterly.

Bed Material Sampling Frequency:
3, sample the surficial bed material in the cross section at least three times per year (high, medium, and low flow).
4, manual in-situ measurement and analysis of streambed material (pebble count), at a frequency of once per year (or longer), at the discretion of the District sediment specialist.

Suspended Sediment Analysis:
1, suspended-sediment concentration.
2, 0.062mm sieve analysis.
3, particle-size distribution.
4, all of the above.

Explanation of abbreviations and codes used in table 4.--continued

Laboratory: W, Worland

Funding Agency:
BLM, Bureau of Land Management
MRB, Geological Survey, Missouri River Basin Program
USGS, Geological Survey, Federal Program
WPUM, Water and Power Resources Service, Upper Missouri Region
WSE, Wyoming State Engineer

Field Office:
B, Buffalo
C, Casper
CF, Cheyenne Field Unit
CH, Cheyenne Hydrologic Surveillance Section
CO, Colorado District
CT, Contractor
GR, Green River
M, Montana
R, Riverton
SD, South Dakota
W, Worland

Table 4. Sediment stations

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION			SAMPLING EQUIPMENT	SUSPENDED SAMPLING FREQ	BED MATERIAL SAMPLING FREQ	LABORATORY	FUNDING AGENCY	FIELD OFFICE	SUSPENDED ANALYSIS TYPE	REMARKS
				SE	TSP	RNGE								
YELLOWSTONE RIVER BASIN														
*@06207510	BIG SAND COULEE AT WYOMING-MONTANA STATE LINE	134	1973-	32	9S	22E	O	1	3	W	BLM	M	1,3	
*@06220500	EAST FORK WIND RIVER NEAR DUBOIS	427	1975-	34	6N	6W	H	3	4	W	MRB	R	1,3	
@06225500	WIND RIVER NEAR CROWHEART	1891	1971-	16	3N	2W	H	3	4	W	WSE	R	3	
@06226000	WYOMING CANAL NEAR LENORE		1975-	17	3N	1W	H	5	-	W	WPUM	W	4	SAMPLED BY WPRS
06227500	WYOMING CANAL BELOW PILOT DIVERSION, NR MORTON		1975-	20	3N	1E	H	5	-	W	WPUM	W	4	SAMPLED BY WPRS
*06246800	OCEAN DRAIN NEAR MIDVALE		1979-	25	3N	3E	H	3	-	W	WPUM	R	4	
*@06253000	FIVEMILE CREEK NEAR SHOSHONI	418	1948-75, 1978-	19	3N	6E	H	3	-	W	MRB	R	1	
*@06256900	DRY CREEK NEAR BONNEVILLE	52.6	1965-	8	38N	92W	H	1	3	W	BLM	R	1,3	
06258010	COTTONWOOD DRAIN NEAR SHOSHONI		1979-	27	4N	5E	H	4	-	W	WPUM	R	1,3	
*@06259000	WIND RIVER BELOW BOYSEN RESERVOIR	7701	1979-	9	5N	6E	H	3	-	W	USGS	R	1,2	
*@06267400	EAST FORK NOWATER CREEK NEAR COLTER	149	1977-	31	46N	92W	H	6	-	W	BLM	W	1,2	
*06267900	MIDDLE FORK FIFTEENMILE CREEK NEAR WORLAND		1979-				H	9	-	W	BLM	W	1,2	
*@06268500	FIFTEENMILE CREEK NEAR WORLAND	518	1949-72, 1979-	27	47N	93W	P	6	-	W	BLM	W	1,2	
*@06270000	NOWOOD RIVER NEAR TEN SLEEP	803	1971-	27	47N	88W	H	3	-	W	WSE	W	4	
*@02678000	DRY CREEK NEAR GREYBULL		1979-	7	52N	94W	H	9		W	BLM	W	1,2	
*@06279500	BIGHORN RIVER AT KANE	15765	1946-64, 1969-	9	55N	94W	H	3	-	W	MRB	W	1,3	
@06283800	SHOSHONE RIVER AB WILLWOOD DAM, NR WILLWOOD		1979-	19	54N	100W	H	2	-	W	WPUM	W	1,2	
06283950	WILLWOOD CANAL NEAR WILLWOOD		1979-	9	54N	100W	H	5	-	-	WPUM	W	4	SAMPLED BY WPRS
06284000	SHOSHONE RIVER BELOW WILLWOOD DAM	1833	1979-	9	54N	100W	H	5	-	-	WPUM	W	4	SAMPLED BY WPRS
*@06285100	SHOSHONE RIVER NEAR LOVELL	2350	1971-	16	56N	96W	H	3	-	W	WSE	W	4	
*@06305500	GOOSE CREEK BELOW SHERIDAN	392	1971-	15	56N	84W	H	2	-	W	WSE	B	4	
*@06313400	SALT CREEK NEAR SUSSEX	769	1976-	8	42N	79W	H	3	3	W	USGS	C	1,3	
*@06313500	POWDER RIVER AT SUSSEX	3090	1949-53, 1976-	13	43N	79W	H	3	3	W	USGS	CT	1,3	
*@06316400	CRAZY WOMAN CREEK AT UPPER STATION, NEAR ARVADA	945	1977-	18	52N	77W	H	3	3	W	USGS	CT	1,3	
*@06320200	CLEAR CREEK BELOW ROCK CREEK, NEAR BUFFALO	322	1976-	30	51N	81W	H	2	3	W	USGS	B	1,3	
*@06320400	CLEAR CREEK AT UCROSS	409	1976-	19	53N	80W	H	2	3	W	USGS	B	1,3	
*@06324000	CLEAR CREEK NEAR ARVADA	1110	1950-53, 1975-	36	57N	77W	H	2	3	W	USGS	B	1,3	
*#06324500	POWDER RIVER AT MOORHEAD, MT	8080	1951-53, 1956-57, 1969-72, 1975-	8	9N	48W	G	1	-	W	-	B	1	
*@06324890	LITTLE POWDER R BELOW CORRAL CREEK, NEAR WESTON	204	1977-	12	52N	72W	H	3	3	W	USGS	CT	1,3	
*@06324925	LITTLE POWDER RIVER NEAR WESTON	540	1977-	19	54N	70W	H	3	3	W	USGS	CT	1,3	
*@06324970	LITTLE POWDER RIVER ABOVE DRY CREEK, NEAR WESTON	1230	1975-	13	57N	71W	H	3	3	W	WSE	CT	1,3	
CHEYENNE RIVER BASIN														
*@06364700	ANTELOPE CREEK NEAR TECKLA	959	1977-	35	41N	70W	H	7	3	W	USGS	CT	1,3	
*@06365300	DRY FORK CHEYENNE RIVER NEAR BILL	128	1976-	31	38N	73W	H	3	3	W	BLM	C	1,3	
*@06365900	CHEYENNE RIVER NEAR DULL CENTER	1527	1976-	20	40N	68W	H	3	3	W	USGS	CT	1,3	
*@06375600	LITTLE THUNDER CREEK NEAR HAMPSHIRE	234	1977-	33	43N	67W	H	7	3	W	USGS	CT	1,3	
*@06376300	BLACK THUNDER CREEK NEAR HAMPSHIRE	535	1979-	31	42N	65W	H	7	3	W	USGS	CT	1,3	
*@06378300	LODGEPOLE CREEK NEAR HAMPSHIRE	354	1977-	5	41N	64W	H	7	3	W	USGS	CT	1,3	
*@06386000	LANCE CREEK NEAR RIVERVIEW	2070	1976-	14	39N	62W	H	3	3	W	USGS	C	1,3	
*@06425720	BELLE FOURCHE RIVER BEL RATTLESNAKE CR, NR PINEY	495	1975-	9	46N	71W	P	6	3	W	USGS	B	1,3	
*@06425750	COAL CREEK NEAR PINEY	-	1980-	12	46N	71W	P	6	3	W	USGS	B	1,3	
*@06425780	BELLE FOURCHE RIVER ABOVE DRY CREEK, NEAR PINEY	594	1975-	25	47N	71W	P	6	3	W	USGS	B	1,3	
*@06425900	CABALLO CREEK AT MOUTH, NEAR PINEY	260	1977-	4	47N	70W	H	7	3	W	USGS	CT	1,3	

* Also water-quality station.
@ Also surface-water station.

Table 4. Sediment stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	PERIOD OF RECORD	LOCATION SE	LOCATION TSP	LOCATION RNGE	SAMPLING EQUIPMENT	SUSPENDED SAMPLING FREQ.	BED MATERIAL SAMPLING FREQ.	LABORATORY	FUNDING AGENCY	FIELD OFFICE	SUSPENDED ANALYSIS TYPE	REMARKS
CHEYENNE RIVER BASIN (continued)														
*@06425950	RAVEN CREEK NEAR MOORCROFT	76	1977-	1	48N	69W	H	7	3	W	USGS	CT	1,3	
*@06426400	DONKEY CREEK NEAR MOORCROFT	246	1977-	30	50N	68W	H	7	3	W	USGS	CT	1,3	
*@06426500	BELLE FOURCHE RIVER BELOW MOORCROFT	1670	1976-	24	50N	68W	H	3	3	W	BLM	C	1,3	
@06430500	REDWATER CR AT WYOMING-SOUTH DAKOTA STATE LINE	471	1971-	18	7N	1E	H	3	4	W	WSE	SD	1,3	
PLATTE RIVER BASIN														
*@06623800	ENCAMPMENT RIVER AB HOG PARK CR, NEAR ENCAMPMENT	72.7	1964-	10	12N	84W	H	3	-	W	USGS	CF	1,3	
*@06628800	SAGE CREEK NEAR SARATOGA	263	1972-	32	19N	85W	H	4	3	W	BLM	CF	1,3	
*@06630300	BIG DITCH NEAR COYOTE SPRINGS	110	1974-	30	23N	83W	H	3	3	W	BLM	CF	1,3	
*@06630330	NORTH DITCH NEAR COYOTE SPRINGS	22.6	1976-	19	23N	83W	H	3	3	W	BLM	CF	1,3	
*@06634600	LITTLE MEDICINE BOW RIVER NEAR MEDICINE BOW	963	1971-	22	23N	78W	H	3	3	W	WSE	CF	4	
*@06634990	HANNA DRAW NEAR HANNA	21.6	1974-	34	24N	81W	H	3	3	W	BLM	CF	1,3	
*@06635000	MEDICINE BOW R AB SEMINOE RESERVOIR, NEAR HANNA	2338	1971-	34	24N	81W	H	3	3	W	WSE	CF	4	
*@06639000	SWEETWATER RIVER NEAR ALCOVA	2327	1974-	25	29N	87W	H	3	-	W	WSE	C	1,3	
*#06642000	NORTH PLATTE RIVER AT ALCOVA	10812	1979-	17	30N	82W	H	3	-	W	USGS	C	1,2	
*06644550	NORTH PLATTE RIVER AT CASPER	-	1971-	4	33N	79W	H	3	3	W	WSE	C	1,3	
*@06646780	SAND CREEK NEAR GLENROCK	79.9	1977-	5	33N	74W	H	8	3	W	USGS	C	1,3	
*@06652000	NORTH PLATTE RIVER AT ORIN	14888	1971-	17	31N	69W	H	3	3	W	WSE	C	1,3	
*@06670500	LARAMIE RIVER NEAR FORT LARAMIE	4495	1971-	25	26N	65W	H	3	3	W	WSE	C	1,3	
*@06674500	NORTH PLATTE RIVER AT WYOMING-NEBRASKA ST LINE	22218	1971-	4	23N	58W	H	3	3	W	WSE	C	1,3	
GREEN RIVER BASIN														
*@09209400	GREEN RIVER NEAR LABARGE	3910	1974-	33	26N	112W	H	3	3	W	WSE	GR	1,3	
@09213500	BIG SANDY RIVER NEAR FARSON	322	1971-	17	27N	106W	H	3	3	W	WSE	GR	1,3	SEASONAL
*@09214500	LITTLE SANDY CREEK ABOVE EDEN	134	1975-	11	26N	105W	H	3	3	W	BLM	GR	1,3	
*@09216000	BIG SANDY RIVER BELOW EDEN	1610	1971-	31	24N	107W	H	3	3	W	WSE	GR	1,3	
*@09216527	SEPARATION CREEK NEAR RINER	55.3	1975-	32	20N	90W	P	6	3	W	BLM	CF	1,3	
*@09216545	BITTER CREEK NEAR BITTER CREEK	308	1976-	36	18N	99W	S	7	3	W	USGS	GR	1,3	
*@09216562	BITTER CREEK ABOVE SALT WELLS CR, NR SALT WELLS	836	1976-	2	19N	103W	H	3	3	W	BLM	GR	1,3	
*@09216565	SALT WELLS CREEK NEAR SOUTH BAXTER	34.7	1975-	15	14N	103W	P	6	3	W	BLM	GR	1,3	
*@09216578	DRY CANYON NEAR SOUTH BAXTER	3.69	1976-	5	14N	102W	HS	7	3	W	BLM	GR	1,3	
*@09216750	SALT WELLS CREEK NEAR SALT WELLS	526	1976-	14	19N	103W	H	3	3	W	BLM	GR	1,3	
*@09217000	GREEN RIVER NEAR GREEN RIVER	14000	1951-	26	18N	107W	O	1	-	W	USGS	GR	1,3	
*@09222000	BLACKS FORK NEAR LYMAN	821	1971-	15	17N	113W	H	3	3	W	WSE	GR	1,3	
*@09222300	LITTLE MUDDY CREEK NEAR GLENCOE	416	1976-	31	19N	116W	H	3	3	W	BLM	GR	1,3	
*@09222400	MUDDY CREEK NEAR HAMPTON	963	1976-	18	18N	113W	H	3	3	W	BLM	GR	1,3	
*09224450	HAMS FORK NEAR GRANGER	670	1971-	30	19N	111W	H	3	3	W	WSE	CH	1,3	
*@09224700	BLACKS FORK NEAR LITTLE AMERICA	3100	1967-	15	18N	109W	H	3	3	W	WSE	GR	4	
*@09235300	VERMILLION CREEK NEAR HIAWATHA, CO	196	1976-	15	12N	100W	H	3	3	W	BLM	GR	1,3	
@09257000	LITTLE SNAKE RIVER NEAR DIXON	988	1971-	8	12N	90W	H	4	3	W	WSE	CO	1,3	
BEAR RIVER BASIN														
*@10027000	TWIN CREEK AT SAGE	246	1976-	7	21N	119W	H	3	3	W	BLM	GR	1,3	
*@10039500	BEAR RIVER AT BORDER	2490	1969, 1979-	15	14S	46E	H	3	-	W	USGS	CH	1,2	
SNAKE RIVER BASIN														
*@13018300	CACHE CREEK NEAR JACKSON	10.6	1968-	1	40N	116W	H	3	3	W	USGS	GR	1,3	

* Also water-quality station.
@ Also surface-water station.

Peak-flow partial-record stations

Explanation of abbreviations and codes used in table 5.

Location: SE, section
TSP, township
RNGE, range

Period of Record: The dates given are the calendar years in which records began or ended. Breaks of less than a year are not shown.

Gage Equipment: CSI, crest-stage indicator
S-R, stage-rainfall recorder

Field Office: B, Buffalo
C, Casper
CF, Cheyenne Field Unit
CH, Hydrologic Surveillance Section
GR, Green River
R, Riverton
W, Worland

Funding Agency: BLM, Bureau of Land Management
WHD, Wyoming Highway Department

Table 5. Peak-flow partial-record stations

STATION NUMBER	STATION NAME	DRAINAGE AREA	LOCATION			PERIOD OF RECORD	GAGE EQUIPMENT	FIELD OFFICE	FUNDING AGENCY	REMARKS
			SE	TSP	RNGE					
YELLOWSTONE RIVER BASIN										
06218700	WAGON GULCH NEAR DUBOIS	4.89	30	42N	107W	1961-	CSI	R	WHD	
06223800	WIND RIVER TRIBUTARY NO 2 NEAR CROWHEART	3.16	18	3N	2W	1961-	CSI	R	WHD	
06226200	LITTLE DRY CREEK NEAR CROWHEART	10.5	35	7N	3W	1961-	CSI	R	WHD	
06226300	DRY CREEK NEAR CROWHEART	97.9	19	5N	2W	1959, 1961-	CSI	R	WHD	
06229700	NORKOK MEADOWS CREEK NEAR FORT WASHAKIE	15.4	8	1N	1W	1965-	CSI	R	WHD	
06229800	SAND DRAW NEAR FORT WASHAKIE	.99	18	1N	1W	1961-	CSI	R	WHD	
06229900	TROUT CREEK NEAR FORT WASHAKIE	16.1	25	1S	2N	1961-68, 1970-	CSI	R	WHD	
06233360	MONUMENT DRAW AT LOWER STATION, NEAR HUDSON	8.38	21	33N	98W	1965-73, 1973-	S-R CSI	R	WHD	
06234590	BOBCAT DRAW NEAR SAND DRAW	2.89	21	33N	95W	1969, 1971-	CSI	R	WHD	
06236000	KIRBY DRAW NEAR RIVERTON	129	3	1N	5E	1951-53, 1961-	CSI	R	WHD	
06238760	W F DRY CHEYENNE C AT UPPER STATION, NR RIVERTON	.69	4	34N	94W	1965-73, 1973-	S-R CSI	R	WHD	
06255300	POISON CREEK TRIBUTARY NEAR SHOSHONI	.39	33	38N	93W	1959-	CSI	R	WHD	
06256600	RED CREEK NEAR ARMINTO	7.15	19	38N	87W	1963-	CSI	C	WHD	
06256700	SOUTH BRIDGER CREEK NEAR LYSITE	10.0	9	40N	91W	1960-	CSI	R	WHD	
06257300	SHOTGUN CREEK TRIBUTARY NEAR PAVILLION	2.57	27	6N	1E	1961-	CSI	R	WHD	
06265200	SAND DRAW NEAR THERMOPOLIS	6.33	2	44N	97W	1960-	CSI	W	WHD	
06265600	TIE DOWN GULCH NEAR WORLAND	1.78	10	45N	94W	1961-	CSI	W	WHD	
06266460	MURPHY DRAW NEAR GRASS CREEK	2.32	28	47N	97W	1965-73, 1973-	S-R CSI	W	WHD	
06267260	NORTH PRONG EAST FORK NOWATER CREEK NEAR WORLAND	3.77	18	46N	91W	1964-73, 1973-	S-R CSI	W	WHD	
06269750	NOWOOD RIVER TRIBUTARY NEAR TEN SLEEP	.42	11	46N	88W	1960-	CSI	W	WHD	
06274190	NOWOOD RIVER TRIBUTARY NO 2 NEAR BASIN	1.51	28	50N	92W	1965-73, 1973-	S-R CSI	W	WHD	
06274250	ELK CREEK NEAR BASIN	96.9	16	50N	93W	1959-	CSI	W	WHD	
06277700	TWENTYFOUR MILE CREEK NEAR EMBLEM	12.8	23	52N	98W	1960-	CSI	W	WHD	
06277750	DRY CREEK TRIBUTARY NEAR EMBLEM	.65	19	52N	97W	1960-68, 1976-	CSI	W	WHD	
06279020	RED GULCH NEAR SHELL	47.8	32	53N	91W	1967, 1970-	CSI	W	WHD	
06299900	SLATER CREEK NEAR MONARCH	18.0	18	57N	84W	1967-	CSI	B	WHD	
06312700	SOUTH FORK POWDER RIVER NEAR POWDER RIVER	262	3	35N	85W	1961-	CSI	C	WHD	
06312795	SANCHEZ CREEK ABOVE RESERVOIR, NEAR ARMINTO	5.53	20	39N	86W	1970-	CSI	C	WHD	
06313020	BOBCAT CREEK NEAR EDGERTON	6.29	10	37N	77W	1965-73, 1973-	S-R CSI	C	WHD	
06313050	EAST TEAPOT CREEK NEAR EDGERTON	5.44	16	37N	78W	1965-72, 1973-	S-R CSI	C	WHD	
06313100	COAL DRAW NEAR MIDWEST	11.4	8	40N	78W	1961-	CSI	C	WHD	
06313630	VAN HOUTEN DRAW NEAR BUFFALO	10.8	33	49N	77W	1971-	CSI	B	WHD	
06316700	POWDER RIVER TRIBUTARY NEAR BUFFALO	1.64	9	52N	77W	1965-73, 1973-	S-R CSI	B	WHD	
06317050	RUCKER DRAW NEAR SPOTTED HORSE	3.98	28	55N	75W	1961-	CSI	B	WHD	
06319100	BULL CREEK NEAR BUFFALO	10.8	29	50N	82W	1969-	CSI	B	WHD	
06324800	LITTLE POWDER RIVER TRIBUTARY NEAR GILLETTE	.81	36	52N	72W	1960-	CSI	C	WHD	
06324900	CEDAR DRAW NEAR GILLETTE	3.45	6	52N	71W	1959-	CSI	C	WHD	
06324910	COW CREEK TRIBUTARY NEAR WESTON	.72	26	53N	71W	1971-	CSI	C	WHD	

Table 5. Peak-flow partial-record stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	LOCATION			PERIOD OF RECORD	GAGE EQUIPMENT	FIELD OFFICE	FUNDING AGENCY	REMARKS
			SE	TSP	RNGE					
CHEYENNE RIVER BASIN										
06379600	BOX CREEK NEAR BILL	112	9	36N	70W	1956-58, 1959, 1961-	 CSI	 C	 WHD	
06382200	PRITCHARD DRAW NEAR LANCE CREEK	5.1	8	37N	65W	1964-72, 1972-	S-R CSI	 C	 WHD	
06387500	TURNER CREEK NEAR OSAGE	47.8	26	47N	64W	1959-	CSI	C	WHD	
06388800	BLACKTAIL CREEK TRIBUTARY NEAR NEWCASTLE	.25	16	44N	61W	1960-	CSI	C	WHD	
06426195	DONKEY CREEK TRIB ABOVE RESERVOIR, NEAR GILLETTE	.2	29	50N	71W	1970-	CSI	C	WHD	
06427700	INYAN KARA CREEK NEAR UPTON	96.5	17	49N	63W	1959-	CSI	C	WHD	
06428100	BELLE FOURCHE RIVER TRIBUTARY NO 2 NEAR HULETT	10.2	3	54N	64W	1962-	CSI	C	WHD	
06429300	OGDEN CREEK NEAR SUNDANCE	8.42	30	52N	62W	1962-65, 1965-72, 1972-	CSI S-R CSI	 C	 WHD	
PLATTE RIVER BASIN										
06629150	COAL BANK DRAW TRIBUTARY NEAR WALCOTT	3.65	3	20N	83W	1962-	CSI	CF	WHD	
06629200	COAL BANK DRAW TRIBUTARY NO 2 NEAR WALCOTT	2.41	4	20N	83W	1962-	CSI	CF	WHD	
06629800	COAL CREEK NEAR RAWLINS	7.32	30	21N	87W	1959-	CSI	CF	WHD	
06630200	BIG DITCH TRIBUTARY NEAR HANNA	7.42	21	22N	81W	1959-70, 1970-72, 1972-	CSI S-R CSI	 CF	 WHD	
06631150	THIRD SAND CREEK NEAR MEDICINE BOW	10.8	29	21N	79W	1965-73, 1973-	S-R CSI	 CF	 WHD	
06634200	SHEEP CREEK NEAR MARSHALL	61.0	30	27N	75W	1961-	CSI	CF	WHD	
06634300	SHEEP CREEK NEAR MEDICINE BOW	174	19	25N	76W	1961-	CSI	CF	WHD	
06634910	MEDICINE BOW RIVER TRIBUTARY NEAR HANNA	3.01	35	24N	81W	1965-73, 1973-	S-R CSI	 CF	 WHD	
06637550	SWEETWATER RIVER NEAR SOUTH PASS CITY	177	28	28N	101W	1958-73, 1974-	 CSI	 R	 WHD	
06638300	WEST FORK CROOKS CREEK NEAR JEFFREY CITY	11.6	31	28N	92W	1961-	CSI	R	WHD	
06638350	COAL CREEK NEAR MUDDY GAP	6.08	4	27N	89W	1961-	CSI	R	WHD	
06641400	BEAR SPRINGS CREEK NEAR ALCOVA	9.33	30	30N	82W	1960-	CSI	C	WHD	
06642700	LAWN CREEK NEAR ALCOVA	11.5	8	29N	80W	1961-	CSI	C	WHD	
06642760	STINKING CREEK NEAR ALCOVA	117	30	30N	80W	1961-	CSI	C	WHD	
06643300	COAL CREEK NEAR GOOSE EGG	5.39	27	32N	81W	1960-	CSI	C	WHD	
06644840	MCKENZIE DRAW TRIBUTARY NEAR CASPER	2.02	12	36N	73W	1965-73, 1973-	S-R CSI	 C	 WHD	
06646700	EAST FORK DRY CREEK TRIBUTARY NEAR GLENROCK	2.60	26	33N	75W	1961-	CSI	C	WHD	
06648780	SAGE CREEK TRIBUTARY NEAR ORPHA	1.38	18	35N	73W	1965-73, 1973-	S-R CSI	 C	 WHD	
06649900	NORTH PLATTE RIVER TRIBUTARY NEAR DOUGLAS	8.53	5	31N	71W	1961-	CSI	C	WHD	
06651800	SAND CREEK NEAR ORIN	27.8	11	31N	70W	1955, 1961-	 CSI	 C	 WHD	
06652400	WATSON DRAW NEAR LOST SPRINGS	6.95	12	32N	68W	1960-70, 1970-72, 1972-	CSI S-R CSI	 C	 WHD	
06661580	SEVENMILE CREEK NEAR CENTENNIAL	11.2	11	17N	77W	1962-	CSI	CF	WHD	
06668040	RABBIT CREEK NEAR WHEATLAND	1.3	22	26N	70W	1965-72, 1972-	S-R CSI	 CH	 WHD	
06670100	LARAMIE RIVER TRIBUTARY NEAR GUERNSEY	1.97	7	25N	65W	1971-	CSI	CH	WHD	
06670985	DRY RAWHIDE CREEK NEAR LINGLE	20	21	27N	62W	1969-	CSI	CH	WHD	
06675300	HORSE CREEK TRIBUTARY NEAR LITTLE BEAR	8.16	10	17N	67W	1961-	CSI	CF	WHD	
06761900	LODGEPOLE CREEK TRIBUTARY NEAR PINE BLUFFS	.44	21	15N	60W	1960-	CSI	CF	WHD	
06762600	LODGEPOLE CREEK TRIBUTARY NO 2 NEAR ALBIN	5.69	28	16N	60W	1960-	CSI	CF	WHD	

Table 5. Peak-flow partial-record stations (continued)

STATION NUMBER	STATION NAME	DRAINAGE AREA	LOCATION			PERIOD OF RECORD	GAGE EQUIPMENT	FIELD OFFICE	FUNDING AGENCY	REMARKS
			SE	TSP	RNGE					
GREEN RIVER BASIN										
09204700	SAND SPRINGS DRAW TRIBUTARY NEAR BOULDER	2.77	8	30N	107W	1961-	CSI	GH	WHD	
09207650	DRY BASIN CREEK NEAR BIG PINEY	47.2	12	28N	112W	1971-	CSI	GR	WHD	
09211300	FOURMILE GULCH TRIBUTARY NEAR FONTENELLE	14.2	15	24N	111W	1971-	CSI	GR	WHD	
09216290	EAST OTTERSON WASH NEAR GREEN RIVER	16.6	23	21N	109W	1969-	CSI	GR	WHD	
09216350	SKUNK CANYON CREEK NEAR GREEN RIVER	15.7	8	20N	107W	1965, 1971-	CSI	GR	WHD	
09216537	DELANEY DRAW NEAR RED DESERT	34.5	8	19N	95W	1961-	CSI	GR	WHD	
09216550	DEADMAN WASH NEAR POINT OF ROCKS	152	25	20N	101W	1962-	CSI	GR	WHD	
09216576	GAP CREEK BL BEANS SPRING CR, NEAR SOUTH BAXTER	35.9	7	14N	103W	1976-	CSI	GR	WHD	
*#09216578	DRY CANYON NEAR SOUTH BAXTER	3.69	5	14N	102W	1976-	S-R	GR	BLM	
09216580	BIG FLAT DRAW NEAR ROCK SPRINGS	19.5	4	15N	102W	1973-	CSI	GR	WHD	
09216600	CUTTHROAT DRAW NEAR ROCK SPRINGS	7.88	17	17N	102W	1959-70, 1970-72, 1972-	CSI S-R CSI	GR	WHD	
09216695	NO NAME CREEK NEAR ROCK SPRINGS	18.2	1	17N	103W	1973-	CSI	GR	WHD	
09216900	BITTER CREEK TRIBUTARY NEAR GREEN RIVER	1.65	16	18N	106W	1959-	CSI	GR	WHD	
09221680	MUD SPRING HOLLOW NEAR CHURCH BUTTE, NEAR LYMAN	8.83	7	16N	113W	1965-73, 1973-	S-R CSI	GR	WHD	
09224600	BLACKS FORK TRIBUTARY NEAR GRANGER	5.03	15	18N	111W	1959-	CSI	GR	WHD	
09224800	MEADOW SPRINGS WASH TRIBUTARY NEAR GREEN RIVER	5.22	18	18N	109W	1962-65, 1968-	CSI CSI	GR	WHD	
09224810	BLACKS FORK TRIBUTARY NO 2 NEAR GREEN RIVER	12.0	8	17N	108W	1965-	CSI	GR	WHD	
09224820	BLACKS FORK TRIBUTARY NO 3 NEAR GREEN RIVER	3.59	28	17N	108W	1965-	CSI	GR	WHD	
09224840	BLACKS FORK TRIBUTARY NO 4 NEAR GREEN RIVER	1.26	33	17N	108W	1965-	CSI	GR	WHD	
09224980	SUMMERS DRY CREEK NEAR GREEN RIVER	423	13	16N	109W	1965-	CSI	GR	WHD	
09225200	SQUAW HOLLOW NEAR BURNTFORK	6.57	29	14N	108W	1965-	CSI	GR	WHD	
09225300	GREEN RIVER TRIBUTARY NO 2 NEAR BURNTFORK	13.0	31	13N	108W	1959, 1961-	CSI	GR	WHD	
09258200	DRY COW CREEK NEAR BAGGS	49.7	19	16N	91W	1970-	CSI	CF	WHD	
BEAR RIVER BASIN										
10019700	WHITNEY CANYON CREEK NEAR EVANSTON	8.93	27	17N	120W	1965-	CSI	GR	WHD	
SNAKE RIVER BASIN										
13019220	SOUR MOOSE CREEK NEAR BONDURANT	2.77	26	37N	112W	1964-	CSI	GR	WHD	

* Also water-quality station.
# Also sediment station.

WATER-RESOURCES PROJECTS

The numerous water-resources projects being conducted in Wyoming are described in the following pages. The descriptions reflect project status as of October 1979. The project number is given following each title. All project leaders in the Wyoming district are located in the Cheyenne office.

The funding agencies during the fiscal year 1980 are shown for each project. The section "Progress and Significant Results" covers the period for fiscal year 1979. The area of each study, unless noted as statewide, is shown as either a shaded area or a large black dot on the index map near the title of each project.

Water-Resources Projects Conducted by the Wyoming District

PROJECT TITLE: Surface-water stations (WY 00-001).

FUNDING AGENCIES: Bureau of Indian Affairs, Bureau of Land Management, City of Cheyenne, Corps of Engineer, Geological Survey, Water and Power Resources Service, Wyoming Department of Economic Planning and Development, Wyoming Department of Environmental Quality, Wyoming Game and Fish, and Wyoming State Engineer.

PROJECT LEADER: Ernest S. Denison.

FIELD LOCATION: Statewide.

PROBLEM: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water resources development. To provide this information, an appropriate data base is necessary.

OBJECTIVE: The objectives are to (1) collect surface-water data sufficient to satisfy needs for current-purpose uses such as (a) assessment of water resources, (b) operation of reservoirs or industries, (c) forecasting of stage or discharge, (d) pollution controls and disposal of wastes, (e) discharge data to accompany water-quality measurements, (f) compact and legal requirements, and (g) research or special studies; and (2) collect data necessary for analytical studies to define for any location the statistical properties of, and trends in, the occurrence of water in streams, lakes, and estuaries for use in planning and design.

APPROACH: Standard methods of data collection will be used as described in the series, "Techniques of Water Resource Investigations of the United States Geological Survey," and partial-record gaging will be used where it serves the required purpose instead of complete-record gaging.

PROGRESS AND SIGNIFICANT RESULTS: Hydrologic data collection was done on schedule and computation of the 1979 water-year records is in progress. During the 1979 water year, two stations were established and eight were discontinued. A new cooperating agency for streamflow data collection is the U.S. Bureau of Indian Affairs. Several indirect measurements were made to define rating curves. Fifteen gaging stations in the outcrop areas of the Madison Limestone in northeastern Wyoming were continued for project WY 75-033; by year's end the number of stations was reduced to five, based on a study of the records obtained to date. The coal-lease monitoring project, WY 77-039, operated eleven streamflow stations in northeastern Wyoming. A report containing data for the floods of 1978 in the Powder River Basin was released to the open files.

PLANS FOR FISCAL YEAR 1980: The present stream-gaging network will continue in operation with five stations expected to be established and two stations deleted to satisfy requests of cooperators. The professional paper on the May 1978 floods in northeastern Wyoming and southeastern Montana, to be published jointly with the Montana district and the National Weather Service, will be completed and processed for publication. To increase efficiency by reducing "dead end" travel, one station in Wyoming was traded for one in Montana and one in Wyoming for one in Colorado. Also, the contractor will take over operation of three stations in exchange for one.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Carlson, D.D., and Green, S.L., 1979, Water-resources investigations of the U.S. Geological Survey in Wyoming, fiscal year 1979: U.S. Geological Survey Open-File Report 79-1278, 115 p.

Parrett, Charles, Carlson, D.D., Craig, Gordon S. Jr., and Hull, J.A., 1978, Data for floods of May 1978 in northeastern Wyoming and southeastern Montana: U.S. Geological Survey Open-File Report 78-985, 16 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 1. Missouri River Basin: U.S. Geological Survey Water-Data Report WY-77-1, 616 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 2. Green River, Bear River, and Snake River Basins: U.S. Geological Survey Water-Data Report WY-77-2, 484 p.

PROJECT TITLE: Ground-water stations (WY 00-002).

FUNDING AGENCIES: City of Cheyenne, Geological Survey, Wyoming Department of Economic Planning and Development, and Wyoming State Engineer.

PROJECT LEADER: Jess O. Ragsdale.

FIELD LOCATION: Statewide.

PROBLEM: (1) Long-term water-level records are needed to evaluate the effects of climatic variations on the recharge to and discharge from the ground-water systems to provide a data base from which to (a) measure the effects of development, (b) to assist in the prediction of future supplies, and (c) to provide data for management of the resource. (2) Short-term water-level records are also needed for (a) assessment of ground-water resources, (b) areal investigations, and (c) water-use investigations.

OBJECTIVE: The objectives are (1) to collect water-level data sufficient to provide a minimum long-term data base so that the general response of the hydrologic system to climatic variations and induced stresses is known and potential problems can be defined early enough to allow planning and management; and (2) to provide a data base against which short-term records acquired in areal studies can be analyzed. This analysis must provide (a) an assessment of the ground-water resource, (b) allow prediction of future conditions, (c) detect and define pollution and supply problems, and (d) provide the data base necessary for ground-water management.

APPROACH: The most advantageous locations for long-term observations will be determined and this network will be refined as records become available and detailed areal studies of the ground-water system more closely define the aquifers, their properties, and the stresses to which they are subjected.

PROGRESS AND SIGNIFICANT RESULTS: During the 1979 water year, a total of about 1,200 water-level measurements were made in about 310 wells. In mid-April mass water-level measurements were made in southeastern Wyoming in areas of heavy pumpage. The open-file report continuing the 1978 data and hydrographs for 1969-78 was not published due to lack of personnel.

PLANS FOR FISCAL YEAR 1980: The observation-well network will be evaluated for geographic and hydrologic coverage. Changes will be made as interpretive ground-water projects are completed, and selected project wells will be added or deleted from the network. Water levels will be measured at all wells at frequencies similar to those of 1978-79. An open-file report containing the 1978 and 1979 data and hydrographs will be prepared.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Carlson, D.D., and Green, S.L., 1979, Water-resources investigations of the U.S. Geological Survey in Wyoming, fiscal year 1978: U.S. Geological Survey Open-File Report 79-1278, 115 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 1. Missouri River Basin: U.S. Geological Survey Water-Data Report WY-77-1, 616 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 2. Green River, Bear River, and Snake River Basins: U.S. Geological Survey Water-Data Report WY-77-2, 484 p.

PROJECT TITLE: Water-quality stations (WY 00-003).

FUNDING AGENCIES: Bureau of Indian Affiars, Bureau of Land Management, Environmental Protection Agency, Geological Survey, Water and Power Resources Service, Wyoming Department of Agriculture, and Wyoming Department of Environmental Quality.

PROJECT LEADER: Joel R. Schuetz.

FIELD LOCATION: Statewide.

PROBLEM: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. For intelligent planning and realistic assessment of the water resource, the chemical and physical quality of the rivers and streams must be defined and monitored.

OBJECTIVE: The objectives are to provide a national bank of water-quality data for broad Federal planning and action programs and to provide data for State and Federal management of interstate waters.

APPROACH: A network of water-quality stations will be operated to provide data on average chemical concentrations, loads, and trends as required by planning and management agencies.

PROGRESS AND SIGNIFICANT RESULTS: During the year, data collection was continued on schedule. Work continued throughout the year on preparation of the annual data reports. Time was also spent in meetings with cooperators and supplying data to outside requests and to district projects. Chemical and daily temperature and conductivity sampling was discontinued at Henry's Fork near Manila, Utah, at the end of the water year. In addition, three NASQAN (National Stream-Quality Accounting Network) stations were started at year's end: Green River near Green River, Wyo.; North Platte River at Alcova, Wyo.; and Wind River below Boysen Reservoir. The report on evaluation of selected water-quality stations was completed and started through the review process. Sampling for picloram and dicamba was continued at 20 stations, providing the long-term monitoring of herbicides needed in support of the special herbicide-sampling project (WY 77-043).

PLANS FOR FISCAL YEAR 1980: Sample collection at Tongue River at State line, near Decker, Mont. and Clarks Fork near Belfry, Mont. was taken over by the Montana District. Sample collection on Little Snake River at Baggs, Wyo. and Little Snake River near Slater, Colo. was taken over by the Colorado District. Wyoming District will assume from Montana the sample collection on Powder River near Moorhead, Mont. EPA discontinued support for NWQSS (National Water Quality Surveillance System) stations on North Platte River at Poison Spider Creek, near Goose Egg, Wyo. and North Platte River below Casper, Wyo. This will be the last year for the EPA Energy Program station operation. The station-evaluation report will be published. Statistical analysis of water-quality data from network stations will be continued.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Carlson, D.D., and Green, S.L., 1979, Water-resources investigations of the U.S. Geological Survey in Wyoming, fiscal year 1979: U.S. Geological Survey Open-File Report 79-1278, 115 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 1. Missouri River Basin: U.S. Geological Survey Water-Data Report WY-77-1, 616 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 2. Green River, Bear River, and Snake River Basins: U.S. Geological Survey Water-Data Report WY-77-2, 484 p.

PROJECT TITLE: Sediment stations (WY 00-004).

FUNDING AGENCIES: Bureau of Land Management, Geological Survey, Water and Power Resources Service, and Wyoming State Engineer.

PROJECT LEADER: Harold B. Fabricius.

LOCATION: Statewide.

PROBLEM: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. Sediment concentrations and discharges in rivers and streams must be defined and monitored.

OBJECTIVE: The major objectives are to (1) provide a national bank of sediment data for use in broad Federal and State planning and action programs, (2) provide data for Federal and State management of interstate waters, and (3) provide data for interpretation in areal studies.

APPROACH: A network of sediment stations will be established and operated to provide data on areal and temporal averages and trends of sediment concentration, sediment discharges, and particle size distribution of sediment being transported by rivers and streams.

PROGRESS AND SIGNIFICANT RESULTS: The collection and processing for publication of sediment data continued on schedule for 75 stations, five of which are newly established. Five stations were sampled by local observers and automatic pumping samplers were operated at six sites. One station was converted from monthly to daily sampling by a local observer. All other stations are sampled weekly, monthly, or quarterly. Ten stations had supplemental single-stage samplers. Concentration data were collected at all stations and bed material at fifty-two stations. Three daily and two monthly stations were discontinued. The Worland laboratory processed 24,614 bottles for 15,800 concentration analyses, 620 sieve analyses (-0.062 mm) and 151 suspended-size analyses. Bed-material analyses were run on 203 samples. Sixty-two percent of the laboratory work was performed for the Montana and North Dakota districts. Data obtained from the network are used to broaden the bank of sediment data for use in Federal and State planning and action programs. In response to a request from several State and Federal agencies, temporary daily sediment stations were operated between April and September 1979 on the North Platte River at Orin, Wyo. and below Guernsey Reservoir. The data will be used to evaluate the effects on water quality of the annual silt run in the river, done each summer to help maintain a system of irrigation canals. Also, the Wyoming District supported a bedload-sampling research project of the Central Region staff by starting a sampling program at three sites using Helley-Smith bedload samplers.

PLANS FOR FISCAL YEAR 1980: Field and laboratory workloads will be approximately the same as in 1979. The Wyoming network will consist of 77 stations, including two sampled daily by obververs and six with automatic pump samplers. Forty-eight stations in Wyoming, Montana, and North Dakota are operated under contract for coal-lease monitoring.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Carlson, D.D., and Green, S.L., 1979, Water-resources investigations of the U.S. Geological Survey in Wyoming, fiscal year 1978: U.S. Geological Survey Open-File Report 79-1278, 115 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 1. Missouri River Basin: U.S. Geological Survey Water-Data Report WY-77-1, 616 p.

U.S. Geological Survey, 1978, Water-resources data for Wyoming, water year 1977, Volume 2. Green River, Bear River, and Snake River Basins: U.S. Geological Survey Water-Data Report WY-77-2, 484 p.

PROJECT TITLE: Flood investigations in Wyoming (WY 59-010).

FUNDING AGENCIES: Geological Survey and Wyoming Highway Department.

PROJECT LEADER: Gordon S. Craig, Jr.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: July 1958 to June 1983.

PROBLEM: The optimal design of highway drainage structures requires a knowledge of the magnitude and frequency of peak discharges expected at a given site. This knowledge may be derived either from data collected at the desired location or from regional analysis of peak-flow characteristics. The paucity of peak-flow data for small drainage basins in Wyoming, particularly for ephemeral streams, restricts the use of the regionalization techniques presently available. A network of peak-flow partial-record sites is needed to supplement the existing network of continuous-record streamflow stations.

OBJECTIVE: The main objective is to obtain sufficient basic hydrologic data to define the magnitude and frequency of floods on a regional basis for the entire state and to publish the interpretative analyses in easily usable form. On request from the cooperator, flood-flow characteristics of streams at specific sites will be determined by studying such factors as: History of past floods; distribution of flow across the flood-plain and main channel; and mean velocities in the main channel and overflow areas.

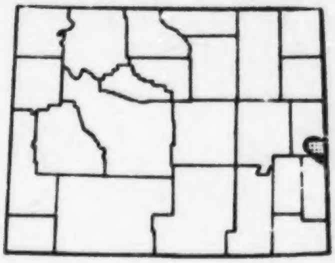
APPROACH: Available flood data will be analyzed, and sites for crest-stage gages will be selected where they will best supplement the existing network of continuous-record stream-gaging stations. Stage-discharge relations will be defined for each crest-stage site by recording water stage and by making current-meter measurements, indirect measurements of peak flow, or by using the "step-backwater method." Basin characteristics that are pertinent in flood-frequency analysis will be determined. Frequency characteristics will be related to basin characteristics by regression analysis. Peak-flow measurements will be made at miscellaneous sites where unusual floods occur.

PROGRESS AND SIGNIFICANT RESULTS: The crest-stage gage network continued in operation without major change. Indirect discharge measurements were made on flood peaks at three crest-stage gage sites. U.S. Geological Survey Open-File Report 78-985, on the floods of 1978 in northeastern Wyoming and southeastern Montana, was published. An expanded version of that report was completed for the Wyoming area and forwarded to the Montana District. This report, co-authored with the National Weather Service, will probably be published in 1980 as a U.S. Geological Survey Professional Paper.

PLANS FOR FISCAL YEAR 1980: The principal activity for 1980 will be the continuation of the operation of the crest-stage gage network. Special hydraulic and hydrologic studies at bridges and culverts will be made when requested by the Wyoming Highway Department. Miscellaneous measurements will be made where outstanding floods occur.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Parrett, Charles, Carlson, D.D., Craig, Gordon S. Jr., Hull, J.A., 1978, Data for floods of May 1978 in northeastern Wyoming and southeastern Montana: U.S. Geological Survey Open-File Report 78-985, 16 p.



PROJECT TITLE: Hydrologic evaluation of the Arikaree Formation near Lusk, Wyoming (WY 74-024).

FUNDING AGENCY: None.

PROJECT LEADER: Marvin A. Crist.

FIELD LOCATION: East-central Wyoming.

PERIOD OF PROJECT: July 1973 to September 1979 (terminated).

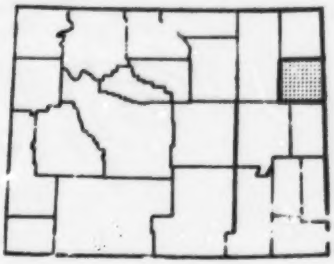
PROBLEM: The Arikaree Formation contains a large amount of water suitable in quality for domestic, industrial, and agricultural uses. Many irrigation wells have been developed near Lusk, Wyoming; yields greater than 500 gal/min are not uncommon. The number of irrigation wells in the Arikaree increases each year. Development of nearby energy resources will increase the need to use ground water for industrial purposes. State water planners have no guidelines for regulation of ground-water development in the area. A study is needed that will describe the ground-water system in detail and provide information on the cause-and-effect of ground-water development.

OBJECTIVE: The objectives are to (1) define the ground-water system in more detail than was done in previous studies; (2) determine the cause-and-effect relationship of current ground-water development; and (3) provide a means of predicting cause-and-effect relationships of future ground-water development.

APPROACH: Inflow and outflow of all water will be inventoried and a water budget prepared. This will require inventories of all large-capacity wells, records of stream diversions for irrigation, pumpage, and acreage irrigated. Hydraulic properties will be determined primarily from aquifer tests. Surface geology and the configuration of the base of the Arikaree will be shown on maps. The water-level surface will be contoured and a saturated thickness map prepared. A digital model will be prepared to simulate hydrologic conditions in the Arikaree. The model will be used to determine the cause-and-effect relationship of ground-water development in the aquifer.

PROGRESS AND SIGNIFICANT RESULTS: Digital water-level recorders were installed on 3 wells by the Wyoming State Engineer's Office to monitor water levels in areas where significant declines were predicted by the digital model developed for the Arikaree Formation. Data from the water-level measurements will be incorporated into the annual report, "Ground-water levels in Wyoming." The project was terminated on September 30, 1979.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Water resources of Weston County, Wyoming (WY 74-026).

FUNDING AGENCY: None.

PROJECT LEADER: Marlin E. Lowry.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: March 1974 to June 1976 (incomplete).

PROBLEM: The demand for ground water will probably increase rapidly in Weston County because of its proximity to the coal deposits in the Powder River Basin and the fact that potential aquifers are at relatively shallow depths, compared to depths in the areas where coal will be mined. Industrial, municipal, and much of the agricultural supplies in the county are obtained from ground water. There are no major perennial streams in the area. The ground-water resources of the county have not been adequately evaluated for orderly development of these resources.

OBJECTIVE: The objectives are to determine (1) the distribution (areally and vertically) and thickness of each of the principal aquifers or aquifer systems; (2) the movement of water in each of the principal aquifers or aquifer systems; (3) the hydraulic characteristics for each principal aquifer or aquifer system; (4) the water-bearing properties of subordinate aquifers; (5) the volume of ground water in storage; (6) the quality of water in each aquifer; (7) the quantity of runoff from small watersheds; (8) the quality of runoff at gaged sites; (9) the effect of ground-water withdrawal on water levels; and (10) to evaluate the potential for artificial recharge.

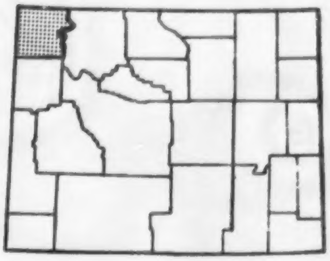
APPROACH: A well inventory will be made and periodic water-level measurements taken. Water samples will be collected and analyzed. Pumping tests will be made to determine aquifer characteristics. Rock samples will be collected and analyzed for water-bearing characteristics. Cross sections of major drainages will be augered. Ground-water use will be inventoried. Existing data will be tabulated, and a geologic map and cross sections will be compiled. Structure-contour and isopach maps of the principal aquifers will be prepared. The volume of ground water in storage (by aquifer) will be calculated and shown on maps. Potentiometric and depth-to-water maps for principal aquifers will be constructed. Well-field histories will be analyzed. The potential for artifical recharge will be evaluated. Runoff characteristics for small basins will be described using channel-geometry techniques.

PROGRESS AND SIGNIFICANT RESULTS: The first draft of the final report was completed during the year.

PLANS FOR FISCAL YEAR 1980: The final report will be completed and published in the Water-Resources Investigations series.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Monitoring wastewater effluent in Yellowstone National Park, Wyoming (WY-74-027).



FUNDING AGENCY: National Park Service.

PROJECT LEADER: Edward R. Cox.

FIELD LOCATION: Northwestern Wyoming.

PERIOD OF PROJECT: June 1974 to September 1981.

PROBLEM: The National Park Service is constructing new or rehabilitating existing evaporation-percolation ponds at several sewage wastewater treatment and disposal sites in Yellowstone National Park. The sites are near streams or lakes. The National Park Service needs to determine the effects of the wastewater effluent on nearby lakes and streams. In order to do this, they need to know the amount and direction of movement of the effluents that percolate from the ponds.

OBJECTIVE: The objectives are to determine (1) the position of the water table and its relation to the ponds and nearby surface-water bodies; (2) the slope of the water table and thus the direction of movement of the effluent; (3) the time-of-travel of effluent from pond to surface-water body; (4) the vertical zone of movement of the effluent; and (5) the baseline water quality in the shallow aquifers in the vicinity of the percolation ponds and in the surface-water bodies.

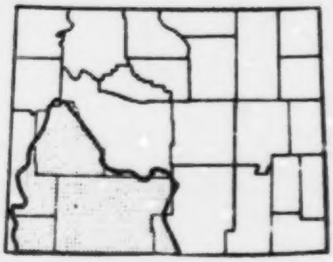
APPROACH: Forty-six wells were installed in unconsolidated material near the sewage ponds. Several wells have been destroyed, including four that were in the area of a new lagoon constructed in 1976. Tracer tests using Rhodomine WT dye were made in a few selected wells. Water samples are collected from the wells and analyzed for chemical quality of the water. Water levels in the wells are measured periodically. A program of monitoring water quality has been established following preliminary data collection depending on funds available for the project.

PROGRESS AND SIGNIFICANT RESULTS: Water levels were measured approximately monthly during autumn, spring, and summer in about 40 wells. About 20 water samples were collected from wells, effluents, and nearby streams and analyzed for dissolved carbon, nitrogen, phosphorus, and other constituents. In addition, about 120 samples were collected from wells and effluents and analyzed for chloride and sulfate. A report containing data collected during the year ending September 1977 and describing wastewater movement near the sites was released to the open file and transmitted to the National Park Service. A similar report containing data collected and interpretations of wastewater movement for the fiscal year 1978 is being prepared.

PLANS FOR FISCAL YEAR 1980: Measuring of wells and sampling of wells, effluents, and streams will continue. A report describing data collected and interpretations made for fiscal year 1979 will be prepared for open-file release.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Cox, E. R., 1979, Preliminary study of wastewater movement in Yellowstone National Park, Wyoming, October 1976 through September 1977: U.S. Geological Survey Open-File Report 79-684, 59 p.



PROJECT TITLE: Water and its relation to economic development in the Green River and Great Divide basins in Wyoming (WY 75-030).

FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Hugh W. Lowham.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: November 1974 to September 1980.

PROBLEM: Development of extensive coal, oil, gas, trona, and oil-shale resources in the project area will require a projected increase in water consumption of 480,000 acre-ft per year by 1990. Development of energy resources in other parts of the State also will require large amounts of water; transbasin diversion of Green River water to other areas could total an additional 270,000 acre-ft per year. Water planners and managers need much more information about available ground and surface water, present quality of the waters, and the impacts on water supply and quality caused by development of energy resources.

OBJECTIVE: The study will be designed to gather information, and to make available to interested industrial, agricultural, and governmental people, interpretive reports that describe (1) the distribution and quality of surface water in space and time; (2) the relationships between surface water and ground water; (3) the distribution, quantity, and quality of ground water; and (4) the hydrology-related aspects of the environment. Efforts of the study will be directed toward (1) describing the water resources and hydrologic relationships that presently exist; (2) developing predictive methods that may be used to describe future conditions, including reactions to increased water development; and (3) establishing monitoring programs for detecting possible changes in water parameters.

APPROACH: Existing water data will be compiled and evaluated. A literature search for present hydrologic knowledge of the area will be conducted. A planning report will be prepared during the first year of the project, outlining the specific techniques to be used in subsequent phases. Regarding water quality, particular attention will be given to trace metals, biological parameters, and trend analyses. Channel-geometry techniques, Landsat satellite imagery, and detailed statistical analyses will be applied to surface-water studies. Aquifer tests and bore-hole and surface geophysical surveys will be used in ground-water studies. Digital models will be developed for chemical-quality and surface-water systems.

PROGRESS AND SIGNIFICANT RESULTS: Emphasis during fiscal year 1979 was placed on completing interpretive reports and on answering numerous requests for hydrologic information. Three U.S. Geological Survey reports, 3 journal articles, 5 abstracts, and 2 other meeting papers were published or released. Significant progress was made on the remaining reports in process. One of these is a regionalization of water-quality characteristics of streams and springs. A logarithmic distribution was found to fit water-quality data collected at a number of sites. Such distributions have not been fully utilized in the past because their lower ends are often truncated due to analytical detection limits. A mathematical procedure has been employed to overcome this truncation, making it possible to describe the full range of values. Another report in process will describe hydraulic characteristics of stream channels in the study area; this should be valuable, because large-scale surface mining that would disrupt many streams is planned for the area.

PLANS FOR FISCAL YEAR 1980: The project will be extended through fiscal year 1980 for completion of eight major reports. A few planned reports have been dropped, but the important data from those reports will be included in the published reports. In addition to the eight final reports, a planning report based on existing information will be prepared for a possible future project to evaluate ground-water potential in the Green River Basin.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Bauer, D.P., Rathburn, R.E., and Lowham, H.W., 1978, Traveltime, unit concentration, longitudinal-dispersion, and reaeration characteristics of two mountain streams in Colorado and Wyoming (ABS): American Water Resources Association, National Symposium on Wetlands, Disney World Village, Florida, 1978, 1 p.

_____, 1978, Traveltime, unit concentration, longitudinal-dispersion, and reaeration characteristics of upstream reaches of the Yampa and Little Snake Rivers, Colorado and Wyoming: U.S. Geological Survey Water-Resources Investigations 78-122, 66 p.

DeLong, L.L., 1978, Predicting effects of coal development on surface-water salinity, Green River Basin, Wyoming (ABS): American Geophysical Union, Symposium on the Protection of the Hydrologic Environment of Surface Mined Lands, San Francisco, California, 1978, 1 p.

_____, 1979, Predicting effects of coal development on surface-water salinity, Green River Basin, Wyoming: University of Wyoming, Wyoming Mining Hydrology Seminar, Laramie, Wyoming, 1979, 1 p.

Engelke, M.J., 1978, The biology of Salt Wells Creek and its tributaries, southwestern Wyoming: U.S. Geological Survey Water-Resources Investigations 78-121, 82 p.

_____, 1979, Wyoming's speckled dace: Wyoming Wildlife, v. 43, no. 1, p. 24.

_____, 1979, Common aquatic insects of Wyoming, part I: Wyoming Wildlife, v. 43, no. 5, p. 28-32.

_____, 1979, Common aquatic insects of Wyoming, part II: Wyoming Wildlife, v. 43, No. 6, p. 18-21.

_____, 1979, The biology of a plains stream, Salt Wells Creek, in southwestern Wyoming (ABS): American Fisheries Society meeting, Laramie, Wyoming, 1979, 1 p.

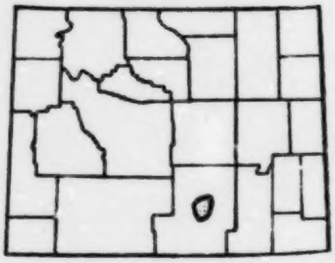
_____, 1979, The biology of a plains stream, Salt Wells Creek, in an oil-shale area, southwestern Wyoming (ABS): Environmental Protection Agency, Symposium on Oil Shale Sampling, Analysis, and Quality Assurance, Denver, Colorado, 1979, 1 p.

Glover, K.C., 1978, A computer program for simulating salinity loads in streams: U.S. Geological Survey Open-File Report 78-884, 31 p.

Lowham, H.W., 1978, Channel geometry--a technique for estimating flow characteristics of western streams (ABS): American Geophysical Union, Symposium of Protection of the Hydrologic Environment of Surface Mined Lands, San Francisco, California, 1978, 1 p.

_____, 1979, Techniques for estimating flow characteristics of Wyoming streams: University of Wyoming, Wyoming Mining Hydrology Seminar, Laramie, Wyoming, 1 p.

PROJECT TITLE: Impacts of economic development and water use on water resources in the Hanna Basin in Wyoming (WY 75-031).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Pamela B. Freudenthal.

FIELD LOCATION: South-central Wyoming.

PERIOD OF PROJECT: July 1974 to September 1980.

PROBLEM: The Hanna Basin has over 22,000 acres of land leased for coal mining. Mining, some of which will be in water-saturated coal beds, will apply stresses on the hydrologic environment through dewatering and due to new demands for water supplies. Federal and State agencies are concerned about the availability of water and the impact of coal mining on the water resources.

OBJECTIVE: The objectives of the project are to describe the present characteristics of the hydrologic environment and to monitor changes in it. At the surface, the objectives are to determine streamflow and water-quality characteristics of streams. In the subsurface, the objectives are to determine the location of the water-level surface and to determine the quality of the water.

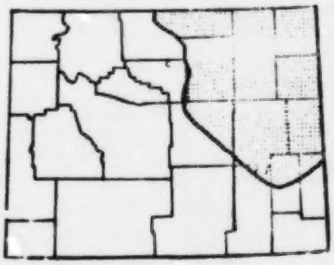
APPROACH: The quality of water and water levels will be monitored in a network of wells in and around the mines, finished below, in, and above the zones to be mined. Gages on the major drainages will be maintained to monitor streamflow, and quality-of-water samples will be collected for salinity and trace-element analyses.

PROGRESS AND SIGNIFICANT RESULTS: During fiscal year 1979 water levels were measured periodically in about 55 wells. Ten wells in the area were cased. An open-file report containing water-quality data was published.

PLANS FOR FISCAL YEAR 1980: Water levels will continue to be measured periodically during fiscal year 1980. A report containing water-level and well data will be completed and processed for publication. All ground-water data will be entered into computer storage (System 2000). Plans will be developed for continuation of monitoring after 1980.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Freudenthal, P.B., 1979, Water-quality data for the Hanna and Carbon basins, Wyoming: U.S. Geological Survey Open-File Report 79-1277, 41 p.



PROJECT TITLE: Water resources of the Powder River structural basin in Wyoming in relation to energy development (WY 75-032).

FUNDING AGENCIES: Department of Energy and Geological Survey.

PROJECT LEADER: Marlin E. Lowry.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: November 1974 to September 1980.

PROBLEM: The problems are those related to large water requirements for development of energy resources in the water-short Powder River Basin and the impacts resulting from such development. An average annual requirement for energy development of 250,000 acre-ft of water per year is projected by 1990. Part of the initial demand could be supplied by surface water and (or) ground water from aquifers of upper Cretaceous or Tertiary age. The impacts of mining, reclamation, transbasin diversions, off-channel and other reservoirs on the shallow aquifers, stream systems, and quality of water is not known.

OBJECTIVE: The objectives of the first phase will be to determine the adequacy of existing data to describe water availability and assess possible impact of the pending development, and to identify specific subjects that should be studied by the district. The findings of the first phase will be used to identify major thrusts for the second phase, which will constitute the district's program in the basin during the succeeding four years. A data-collection system will be designed, based on findings of the first phase, to meet data needs for thrusts and obtain benchmark information.

APPROACH: The existing data and data-collection program will be evaluated and a data-collection program, which is coordinated with other governmental and industrial programs, will be implemented. Various study techniques including those for determination of aquifer properties, streamflow and analysis, channel geometry, isotope study, biological assay, water budgets, modeling, and geophysics will be explored and those that have merit will be pursued in the second phase of the study to the extent manpower and funds are available.

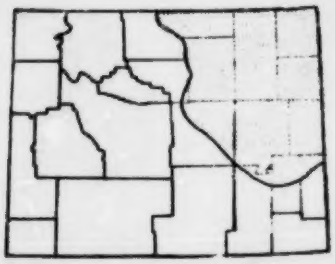
PROGRESS AND SIGNIFICANT RESULTS: One report was published in fiscal year 1979. Three reports were completed and are in review. The first drafts of five other reports were completed. The report in review describing an empirical method for determining average infiltration is especially significant because the Office of Surface Mining regulations for design of hydraulic structures are based on rainfall frequency.

PLANS FOR FISCAL YEAR 1980: The project has been extended through fiscal year 1980 for completion of reports on ground water-surface water relationships and investigation of surface-water flow.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Ringen, B.H., Shown, L.M., Hadley, R.F., and Hinkley, T.K., 1979, Effect on sediment yield and water quality of a nonrehabilitated surface mine in north-central Wyoming: U.S. Geological Survey Water-Resources Investigations 79-47, 23 p.

PROJECT TITLE: Hydrology of Paleozoic rocks in the Powder River Basin and adjacent areas, northeastern Wyoming (WY 75-033).[1]



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Craig L. Joy.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: November 1974 to September 1980.

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[1] This project is subsidiary to project CR 76-192, described on page 112.

PROBLEM: Development of energy resources, especially enormous coal deposits, in the Powder River Basin will require a projected increase of 250,000 acre-ft of water per year by 1990. Ground water is more readily available, and will be the principal source of water in the early years of development until large-scale multipurpose water projects are completed. Paleozoic-age carbonate rocks, largely undeveloped, could yield large quantities of water. Development of large water supplies from the Paleozoic rocks depends on the presence of secondary permeability and on the aquifer response to pumping from nearby wells developed in the same aquifer.

OBJECTIVE: The project is designed to derive a conceptual model of the aquifer system to better predict the quantity and quality of water available from the Paleozoic rocks and to predict some of the effects of its development. Principal objectives will be to determine (1) the distribution, thickness, and physical properties of the aquifer system; (2) the processes that developed the present distribution of aquifer parameters in order to extend point data to other parts of the aquifer system; (3) the potentiometric surface and chemical quality of the water in the aquifer system; and (4) the effects of increased development of water from the aquifer system.

APPROACH: All available data for the aquifer system will be collected and compiled, including data for water wells, oil and gas tests that penetrated the aquifer, and tests, cores, and chemical analyses of water. Borehole and surface geophysical surveys will be made to evaluate and correlate the physical characteristics of the aquifer to the water-yielding properties. Natural tracers will be used to determine both the rate and direction of flow. Temperature differences with depth will be obtained to evaluate vertical movement of water. A streamflow analysis will be made to evaluate recharge and underground flow regime. Digital simulation models will be designed to aid in interpreting the aquifer systems and to predict the response to future stresses.

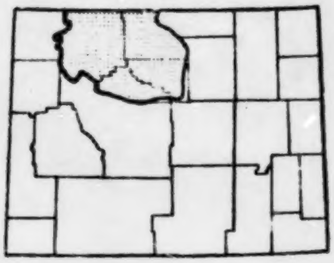
PROGRESS AND SIGNIFICANT RESULTS: The Wyoming District provided man-power and logistical support for hydrologic monitoring and chemical development of Madison Test Hole No. 3 near Billings, Mont. Operation of 15 gaging stations in the outcrop areas was continued (Project WY 00-001). Based on a study of the streamflow records at these stations, it was decided to discontinue five stations in May 1979 and five in September 1979. The five remaining stations, together with one in another program, will be continued in pairs on North Fork Powder River, Beaver Creek, and Little Box Elder Creek. Gravity, apparent water resistivity (Rwa), and temperature-gradient maps were completed and are in process for publication. Hydrologic data and chemical analyses were compiled for waters associated with the Madison Limestone and equivalent rocks. Editing of tables and final revisions of text for publication was 90-percent complete. A report containing chemical analyses of water from the Minnelusa Formation was completed and published.

PLANS FOR FISCAL YEAR 1980: Wyoming will continue to support and participate in the final hydrologic tests of Madison Well No. 3 near Billings, Mont. Reclamation of test well sites and maintenance of test wells will continue. The five remaining streamflow stations in the outcrop areas will continue to be operated. A pumpage inventory and observation-well network will be set up to monitor future impacts on the Madison Aquifer in Wyoming. All remaining reports in process will be completed and published.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Wells, D.K., Busby, J.F., and Glover, K.C., 1979, Chemical analyses of water from the Minnelusa Formation and equivalents in the Powder River Basin and adjacent areas, northeastern Wyoming: Office of Wyoming State Engineer, Wyoming Water Planning Program Report No. 18, 27 p.

PROJECT TITLE: Evaluation of Paleozoic and alluvial aquifers in the Bighorn Basin, Wyoming (WY 75-034).



FUNDING AGENCY: None.

PROJECT LEADER: Maurice E. Cooley.

FIELD LOCATION: North-central Wyoming.

PERIOD OF PROJECT: December 1974 to September 1977 (incomplete).

PROBLEM: In the Bighorn Basin there is a need for development of additional ground-water supplies for irrigation and industrial use. Lack of water for late-season irrigation is a problem now. The best potential sources include (1) the Artesian aquifer systems in the deeply buried Paleozoic rocks in the eastern part of the basin, and (2) the shallow water-table aquifers in the generally thin, flood-plain alluvium along tributaries to the Bighorn River throughout the basin. Additional information is needed about the amount and quality of water that could be developed from the Paleozoic and alluvial aquifers without causing significant decreases in the amount of water in storage, artesian pressures, or streamflow.

OBJECTIVE: For the Paleozoic (artesian) aquifers the objectives are to (1) evaluate effects of past withdrawals on storage, artesian pressures, and water quality; (2) delineate areas most favorable structurally for continued development of the aquifer system; and (3) provide additional water-quality data of wells, springs, and streams for comparisons with past and future data at the same sites. For the alluvial aquifers the objectives are to (1) delineate areas most favorable for ground-water development, particularly the Nowood River (Ten Sleep and Painted Rock Creeks), Greybull River, and Owl Creek; and (2) evaluate the suitability of ground water for irrigation, domestic, and industrial use.

APPROACH: For the Paleozoic aquifers the planned approach is to (1) make mass measurements of artesian pressures in wells; (2) prepare a pressure map for the two artesian aquifers (Ten Sleep and Bighorn/Madison); (3) use aerial photographs and satellite imagery to determine folding and fracturing; (4) make conductivity measurements of streams; and (5) collect samples of water from streams and wells. For the alluvial aquifers the planned approach is to (1) determine lithologic characteristics of the alluvium and prepare a geomorphic map; (2) use electrical resistivity and test drilling to prepare selected profiles; (3) make conductivity measurements of streams; (4) use color photography to determine wet areas and for geomorphologic information; (5) delineate on maps the areas most favorable for ground-water development; and (6) analyze water samples from streams and wells.

PROGRESS AND SIGNIFICANT RESULTS: During the year, two of the four final reports were published and the remaining two prepared for review. The published reports concern the alluvial aquifers in the Greybull and Nowood Rivers. The reports in review concern the alluvial aquifer along Owl Creek and the Paleozoic artesion aquifers in the Ten Sleep area.

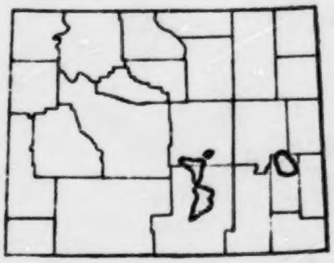
PLANS FOR FISCAL YEAR 1980: During fiscal year 1980, the remaining two reports will be reviewed and processed for publication in the Water-Resources Investigations series.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Cooley, M.D., and Head, W.J., 1979, Hydrogeologic features of the alluvial deposits in the Greybull River valley, Bighorn Basin, Wyoming: U.S. Geological Survey Water-Resources Investigations 79-6, 38 p., 2 pl.

_____, 1979, Hydrologic features of the alluvial deposits in the Nowood River drainage area, Bighorn Basin, Wyoming: U.S. Geological Survey Water-Resources Investigations 79-1291, 55 p., 2 pl.

PROJECT TITLE: Algal-growth potential of principal North Platte River reservoirs in Wyoming (WY 76-035).



FUNDING AGENCY: None.

PROJECT LEADER: Samuel J. Rucker, IV.

FIELD LOCATION: Central Wyoming.

PERIOD OF PROJECT: July 1975 to September 1979 (incomplete).

PROBLEM: Eutrophic conditions may be developing in one or more of the four major reservoirs on the North Platte River (Seminoe, Pathfinder, Alcova, and Glendo). Oxygen depletion could have an adverse effect on recreational use of the reservoirs and on fish habitat. Development of mineral resources, particularly coal mining, is taking place at locations adjacent to one of the reservoirs. There is no information about the present state of algal growth with which to evaluate the seriousness of the problem, to evaluate changes caused by mining activities, or to predict future trends.

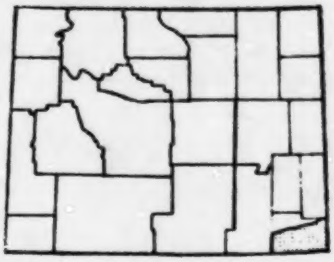
OBJECTIVE: The objectives of the study are to (1) determine the extent of algal growth in the four major reservoirs; (2) evaluate trends in algal-growth potential, including effects of effluent from coal-mining activities adjacent to the reservoirs; and (3) determine the feasibility of developing a model for predicting algal growth (modeling would be a follow-up project).

APPROACH: The first three years will be devoted exclusively to data collection, with analysis of data and preparation of a report scheduled for the fourth year. Vertical-profile water samples will be collected monthly (May-October) from a boat at sites above the dams and in the principal arms of each reservoir. Sampling will also be done twice each winter. Field parameters will include dissolved oxygen and temperature. Lab parameters will include nitrogen ammonia (NH_4); nitrite + nitrate (NO_2+NO_3); phosphorus (P); residue, and algal-growth potential (AGP). A set of phytoplankton samples will be collected each year in early spring and in late summer for identification of genera. Graphical and statistical techniques, such as regression, will be used.

PROGRESS AND SIGNIFICANT RESULTS: The sampling for this study was completed and the analysis of the data started. Results of analyses of bottom samples from Seminoe Reservoir when the reservoir was very low in 1978 showed very high levels of nutrients. As the reservoir filled, bottom material was stirred up, resulting in very high algal cell counts. Present conditions have been reasonably well documented; however, a predictive algal-growth model probably cannot be developed from the available data.

PLANS FOR FISCAL YEAR 1980: During 1980 the statistical analysis of the data will be completed. The final report will be completed and processed for publication in the Water-Resources Investigations series.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Quantitative study of the Tertiary aquifers in southern Laramie County, Wyoming (WY 77-038).

FUNDING AGENCY: None.

PROJECT LEADER: Marvin A. Crist.

FIELD LOCATION: Southeastern Wyoming.

PERIOD OF PROJECT: October 1976 to September 1979 (incomplete).

PROBLEM: Ground-water development for irrigation in Laramie County has increased significantly the past 3 years. Part of the development is upgradient of two areas that have been designated as Control Areas by the Wyoming State Board of Control. Development is regulated within the Control Areas, but generally is not restricted outside these areas. State water administrators need more information about the development and its effect on water levels and stream discharge, and a way to predict the result of decisions to regulate future development. A model of the ground-water system in the shallow aquifers is needed.

OBJECTIVE: The objectives are to (1) determine the extent of ground-water development for irrigation, industry, and municipal use, and describe the effect of this development on water levels and stream discharge in the study area; and (2) provide a means of predicting the effects of alternative ground-water management decisions.

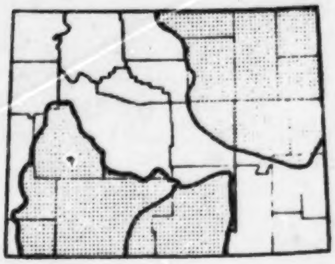
APPROACH: Data will be collected and compiled to make a quantitative analysis of the hydrologic system in the Tertiary aquifers within the study area. A digital model with coarse grid will be prepared utilizing available information. The model would be used to test and verify concepts of recharge and ground-water movement in southern Laramie County. The grid density will be increased in areas of development where more information is available locally. The detailed model would be used to predict the effects of pumping.

PROGRESS AND SIGNIFICANT RESULTS: During fiscal year 1979 the final report, "Effect of pumpage on ground-water levels in Laramie County, Wyoming," was started through the process of colleague review. A digital model was developed for the ground-water system in post-Cretaceous rocks. On the basis that the model can reproduce water-level changes satisfactorily in the areas of 37 observation wells, it is concluded that the model adequately simulates hydrologic conditions and may be used to predict the effect of applied stress on the system.

PLANS FOR FISCAL YEAR 1980: The final report will be published in a Water-Resources Investigation/Open-File Report.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Water-resources monitoring in the Powder River, south-central, and southwestern coal regions in Wyoming (WY 77-039).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Joel R. Schuetz.

FIELD LOCATION: Northeastern, south-central, and southwestern Wyoming.

PERIOD OF PROJECT: January 1977 to September 1980.

PROBLEM: Coal mining and associated developments of the scale and duration anticipated in major coal-producing regions of the West may have adverse effects on the water resources of these regions. Mine dewatering, changes in land-use patterns, disposal of wastes, stream-channel realignment, and withdrawals of water for industrial and domestic use may significantly alter existing surface- and ground-water systems on a regional basis, limit available supplies, interfere with traditional water uses, and cause deterioration of the remaining water resources.

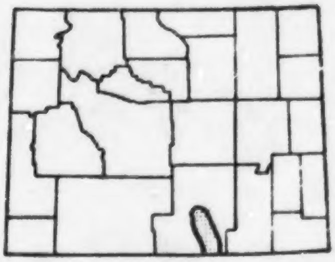
OBJECTIVE: The objective of the program is to determine the characteristics of the regional water-resources system and to detect and document changes in the system or its components that may be associated with coal mining.

APPROACH: The existing water-resources monitoring program will be evaluated for its regional-surveillance value and additional data sites will be added or existing sites upgraded as needed. Data that continuously or periodically describe ground-water levels and quality, and streamflows and their quality will be evaluated so that changes may be detected and documented.

PROGRESS AND SIGNIFICANT RESULTS: Operation of the eleven coal-lease monitoring stations was performed satisfactorily by the contractor, Morrison and Maierle, Inc. Contract performance was evaluated and documented several times by different USGS personnel. Base-flow measurements of discharge and selected chemical quality were obtained in August-September and October 1978 to supplement the project data base and to provide gain/loss information. The data will be published in a joint report with Montana (in process). Construction of three cableways and rehabilitation of a fourth was completed by contract. A report, "Verification of step-backwater computations on ephemeral streams in northeastern Wyoming," was completed and is in review. The report documents the validity of the step-backwater method as applied at three project stations. Plans for a report describing the characteristics of the hydrologic system in the Powder River Basin were dropped in order to alleviate duplication of work being done in Project WY 75-032 (Water resources of the Powder River structural basin). The Central Region staff approved that change in plans.

PLANS FOR FISCAL YEAR 1980: Contractor operation will be monitored for quality assurance. Stations under contractor operation will increase from 11 to 13. Sampling for phenols and cyanide will be initiated at all USGS and contractor operated stations in the Powder River Basin as a result of their being found as contaminants in ground water near Gillette. The adequacy of the network and chemical-quality parameters will be evaluated. Results of the evaluation will be used in preparation of the new Request for Proposal (RFP) for 1981-83 operation.

REPORTS PUPLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Effects of herbicide usage on water quality of selected streams in Wyoming (WY 77-043).

FUNDING AGENCIES: Geological Survey and Wyoming Department of Agriculture.

PROJECT LEADER: Joel. R. Schuetz.

FIELD LOCATION: South-central Wyoming.

PERIOD OF PROJECT: June 1977 to September 1980.

PROBLEM: Local weed- and pest-control districts will be spraying the banks of selected streams (and islands in larger rivers) throughout Wyoming with Tordon (4-amino-3, 5, 6-trichloropicolinic acid), Banvel (2-methoxy-3, 6-dichlorobenzoic acid), and 2,4-D. The Wyoming Department of Agriculture needs to know whether or not any of these herbicides appear in the water or bed material downstream from the spraying activity. This problem could be compounded by the extremely low flow expected in reaches of some rivers.

OBJECTIVE: The objectives are to determine the effects of herbicide spraying on water quality and on bed materials in the study reach.

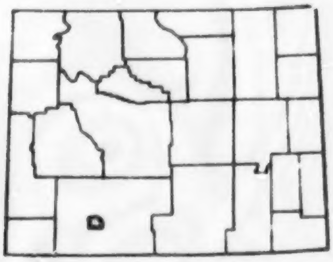
APPROACH: Sets of water- and bed-material samples will be collected upstream and downstream from the spray area before, during, and after the herbicide is applied. Application will last for about 8 weeks, during which sample sets will be collected twice a week immediately downstream. Samples will be analyzed in the Central Laboratory. Results will be examined and the effects on water quality determined.

PROGRESS AND SIGNIFICANT RESULTS: Herbicide sampling continued at about the same level as the previous year. There were several changes in sampling location. Sites dropped from the study were Belle Fourche River at Wyoming-South Dakota State line, Beaver Creek near Newcastle, and Little Wind River near Riverton. Stations added to the program were Crazy Woman Creek at upper station near Arvada, Nowood River at Manderson, Shell Creek near Greybull, Smiths Fork near Lyman, and Blacks Fork near Lyman. Herbicide sampling at 20 stations in the water-quality network (Project WY 00-003), used as a base for this project, also was included throughout the year. A report on data collected through 1978 was written and started through the review process.

PLANS FOR FISCAL YEAR 1980: Sampling for the 1979 season will be completed in October. Present plans are to continue the program in 1980. A report on the results of 1979 sampling will be prepared.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: A preliminary hydrologic investigation of an in-situ oil-shale retorting site near Rock Springs, Wyoming (WY 78-045).



FUNDING AGENCY: None.

PROJECT LEADER: Everett A. Zimmerman.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: October 1977 to September 1979 (terminated).

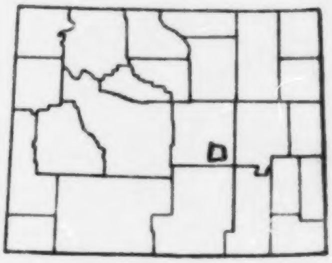
PROBLEM: An in-situ oil-shale retorting experiment was conducted in 1969 by the Department of Energy in the Tipton Shale Member of the Green River Formation at Site 4 near Rock Springs, Wyo. Prior to combustion, a 20-foot thick section of the oil shale, having extremely low porosity and permeability, was extensively fractured, using electrolinking, hydraulic, and chemical-explosive methods. The Environmental Protection Agency and Department of Energy are concerned about possible effects of the in-situ retorting of oil shale on nearby aquifers and need hydrologic and water-quality data for the site.

OBJECTIVES: The objectives of this study are to collect and publish hydrologic and water-quality data from within and adjacent to the combustion zone during dewatering.

APPROACH: The Department of Energy will drill into and dewater the burned area at Site 4. DOE will also drill three observation wells in unburned areas adjacent to and on three sides of the burned area. The well sites will be selected using data provided by DOE from core holes drilled before and after the burn and from an infrared surface-temperature survey made after the burn. Water-level and pumpage data and water samples will be collected from all 4 wells during dewatering. The samples will be split and sent to USGS and DOE laboratories for chemical analysis. The data will be published in an open-file report.

PROGRESS AND SIGNIFICANT RESULTS: Because of problems at the in-situ oil-shale retorting experimental site, it is not likely that the dewatering and, hence, the work planned for this project will ever be done. Consequently, the project was terminated, and all funds allotted for fiscal year 1979 were returned to USGS headquarters for use elsewhere.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Digital model of the alluvial aquifer in Bates Hole, central Wyoming (WY 78-047).

FUNDING AGENCIES: Geological Survey and Wyoming State Engineer.

PROJECT LEADER: Kent C. Glover.

FIELD LOCATION: Central Wyoming.

PERIOD OF PROJECT: October 1977 to September 1980.

PROBLEM: A total of 10 high-yield irrigation wells are proposed for installation in Bates Hole. Existing surface-water diversions virtually depleted the flow of Bates Creek during the irrigation season. The Wyoming State Engineer needs an evaluation of the effects of these withdrawals on streamflow in order to make a final decision on whether or not to permit the development.

OBJECTIVE: The objectives of this study are to define the relationship between Bates Creek and its associated alluvial aquifer and to predict the effects of the proposed pumpage on streamflow and water levels within the area.

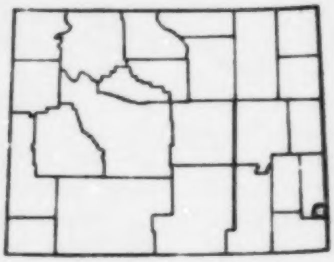
APPROACH: The approach to be taken in this study is to (1) conduct a hydrogeologic reconnaissance of the alluvial aquifer, including a) collection of lithologic and water-table data at approximately 30 wells, which will require drilling 20 observation wells, b) installation of three stream gages, c) compilation of a surface-geology map, a map of the base of the aquifer, and water-table maps for irrigation and non-irrigation seasons, d) aquifer tests of stream depletion, e) seepage runs on Bates Creek, and f) monitoring pumpage and diversions; (2) to develop a digital two-dimensional ground-water flow model for the area; and (3) to simulate the proposed pumpage to predict the effects on streamflow and water levels.

PROGRESS AND SIGNIFICANT RESULTS: Hydrologic-data collection for this study was completed. A major accomplishment of fiscal year 1979 was the completion of a digital model of the study area under steady-state conditions, including model calibration and sensitivity analyses. The calibrated steady-state potentiometric surface deviated an average of 2.5 feet from observed water levels. Calibrated stream leakage was essentially identical to measured values. Extension of the digital model to the transient-flow period of April 1978 thru October 1978 was started. This procedure was nearing completion at year's end. A first draft of the project report has been written for the completed parts of the study, including the hydrologic reconnaissance and steady-state model development.

PLANS FOR FISCAL YEAR 1980: Development of the digital model will continue for the transient-flow period of April 1978 thru October 1978. Prediction of changes in water levels and stream leakage in response to hypothetical future ground-water pumpage will be made using the digital model. The final report will be completed and processed for publication.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Digital model of the hydrologic system in the La Grange area, southeastern Wyoming (WY 78-048).



FUNDING AGENCIES: Geological Survey and Wyoming State Engineer.

PROJECT LEADER: William B. Borchert.

FIELD LOCATION: Southeastern Wyoming.

PERIOD OF PROJECT: October 1977 to September 1980.

PROBLEM: Surface water and ground water are used for irrigation in the La Grange area. Surface water stored in a water-district reservoir is supplemented by ground water pumped from district wells adjacent to the reservoir and by springs at the reservoir. The reservoir is down gradient of 27 irrigation wells in a $7\ \text{mi}^2$ area where water-level declines have occurred in the last 3 years. Because of concern about possible additional water-level declines, the Wyoming State Engineer needs to know the effect of current stresses on the system, as well as a means of predicting future stresses, for water administration.

OBJECTIVE: The objectives are to define the effects of surface-water use and ground-water pumpage on water levels, to simulate these effects with a digital model, and using the model, predict the effects of possible future stresses.

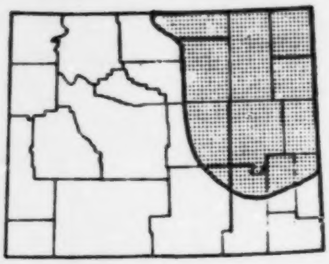
APPROACH: Observation wells and test holes will be drilled in and near the reservoir and in other parts of the area where needed to define hydraulic gradients and the base of the White River Formation. An observation-well network will be established to monitor the effects of pumpage and surface-water recharge. Mass water-level measurements will be made and used to compile maps of the water-table configuration. Electric logs and drill samples will be analyzed to determine the base of the White River Formation. Seepage runs on creeks and measurements of surface-water diversions will be made. A current pumpage inventory of large-capacity wells will be compiled. A digital two-dimensional flow model will be used for parameter estimation and adjustment of the data describing the flow system. After calibration of the model, responses of the model to short-term and long-term stresses will be compared with known responses of the flow system.

PROGRESS AND SIGNIFICANT RESULTS: Mass water-level measurements were done to indicate seasonal ground-water storage changes. Using differential leveling, land surface altitudes were determined for 72 selected observation wells and irrigation wells. This was necessary to define the relatively flat hydraulic gradients in the area where secondary permeability exists in the White River Formation. All available electric logs for the area were compiled and analyzed in conjunction with drill samples to determine the base of the White River Formation. Throughout most of the area the base was a Cretaceous paleosol consisting of a grayish-orange-pink to a pale-yellowish-brown, hard, silty clay. Using a closed-contour method and water levels from wells in the vicinity of the reservoir, the hydraulic conductivity of the White River Formation was estimated as 770 feet/day near the reservoir. This value favorably compares with values of hydraulic conductivity determined from aquifer tests in the area. Interpretation of data continued; the data necessary for the ground-water flow model were compiled. Parameter estimation and adjustment were begun with the model. Initial model results indicated a need for better definition of hydraulic gradients adjacent to and under Sixty-Six Mountain.

PLANS FOR FISCAL YEAR 1980: Additional observation wells will be drilled to define the hydraulic gradient along the southern margins of and under Sixty-Six Mountain. Interpretation of data will continue; the data necessary for the ground-water flow model will be revised. Following parameter estimation and adjustment, the model will be further tested and refined using short-term and long-term stresses. The responses of the model will be compared with known responses of the flow system. The final report will be completed and processed for publication.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Northern Great Plains Regional Aquifer-System Analysis, Wyoming (WY 78-049).[1]



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Dwight T. Hoxie.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: October 1977 to September 1981.

PROBLEM: Rapid development of energy resources in the Northern Great Plains will put stresses on heretofore little used aquifers for water requirements and waste disposal. Previous studies have concentrated on counties or river and structural basins. There is now a need for a regional study of potential aquifers. More knowledge is needed so water development and management alternatives can be evaluated. To provide this knowledge, the Wyoming District will concentrate on aquifers above the Madison and below the Pierre Shale (Cretaceous). The study area is essentially the same as the regional Madison study. Four districts in the Northern Great Plains will participate with coordination by a Central Region staff.

OBJECTIVE: The overall objectives of the project are to provide a quantitative evaluation of the principal hydrologic systems, the quantity and quality of the water in the principal aquifers, the amounts of water available to wells under existing technology, and the effects of withdrawing the water.

The ultimate objective is to provide water managers with technical means of administering and regulating the development of water resources in the project area with emphasis on ground water.

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[1] This project is subsidiary to project CR 78-230, described on page 116.

APPROACH: The areal extent of potential aquifers will be defined from previous studies, existing geohydrologic data will be compiled and evaluated, and a program will be developed to selectively collect additional data. The physical parameters of aquifers will be determined by machine processing of digitized geophysical logs. Recharge and discharge from streamflow records, seepage runs, well pumpage, evapotranspiration, and infiltration estimations will be determined. Digital models of the systems will be developed as a predictive means to evaluate alternatives for development of the aquifers and management of the systems. Water quality will be described and geochemical trends and anomalies defined. A data-collection network will be developed for future monitoring of systems.

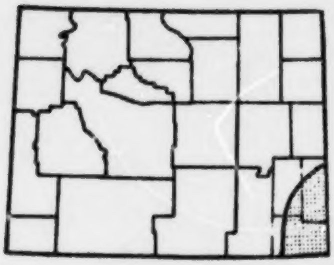
PROGRESS AND SIGNIFICANT RESULTS: During fiscal year 1979, the Wyoming project staff completed the site study of evapotranspiration in the Powder River Basin of Wyoming and Montana. The acquisition of water-quality data for Northern Great Plains aquifer systems in northeastern Wyoming was completed. An analysis of drill-stem test data for the Dakota aquifer system was started. Hydraulic testing and water-quality sampling of the Northern Great Plains hydrologic test well near Arvada, Wyo. was completed. A first-pass preparation of photo-lineation maps of the Northern Great Plains region was completed. The effort to update and revise the ground-water data base continued.

PLANS FOR FISCAL YEAR 1980: A major effort in fiscal year 1980 will be to develop a digital ground-water model for the Dakota aquifer system in the Northern Great Plains region. The areal estimate of evapotranspiration discharge rate for the Powder River Basin in Wyoming and Montana will be completed. The photo-lineation maps will also be completed. A statistical analysis of water-quality data will be made.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

U.S. Geological Survey, 1979, Plan of study for the Northern Great Plains regional aquifer-system analysis in parts of Montana, North Dakota, South Dakota, and Wyoming: U.S. Geological Survey Water-Resources Investigations 79-34, 20 p.

PROJECT TITLE: High Plains Regional Aquifer-System Analysis, Wyoming (WY 78-050).[1]



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Charles F. Avery.

FIELD LOCATION: Southeastern Wyoming.

PERIOD OF PROJECT: October 1977 to September 1982.

PROBLEM: The Ogallala Formation and associated rocks are the principal aquifers underlying the High Plains. The economic future of the High Plains and surrounding area is heavily dependent upon the capacity of the aquifer to sustain withdrawals. Comprehensive knowledge of the aquifer system is needed so that water-management alternatives can be evaluated and the economic life of the aquifer projected. To provide that knowledge, the USGS will do a 5-year study; eight districts, including Wyoming, will participate, with coordination by Central Region staff.

OBJECTIVE: The overall (Regional) objectives are to (1) describe the quantity and quality of the water resource and the operation of the hydrologic system; (2) develop a regional water-resources data storage and retrieval system; (3) develop data-collection networks for future monitoring; (4) develop digital models of the aquifer system; and (5) evaluate ground-water management alternatives using the models. The objectives for Wyoming will be to provide hydrogeologic data for the post-Cretaceous formations in southeastern Wyoming to the Regional project staff in support of the overall objectives.

APPROACH: The areal extent of aquifer(s) will be defined based on previous studies. Geophysical logs will be examined to help determine aquifer thickness. About 25 test holes will be drilled. Ground-water occurrence and movement, aquifer properties, and recharge will be determined from existing data or from aquifer tests on new wells. Ground-water discharge will be estimated from pumpage and irrigated acreage inventories, and from streamflow measurements. Approximately 50 water samples will be collected and analyzed. Periodic mass water-level measurements will be made. All existing and new data will be compiled and entered into the Regional computer system. Work will be done with the Regional project team to apply Wyoming data to the Regional ground-water model.

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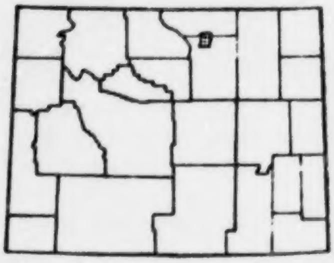
[1] This project is subsidiary to project CR 78-229, described on page 114.

PROGRESS AND SIGNIFICANT RESULTS: Sixty-five test holes were drilled; 49 of those were cased as observation wells. Ground-water quality data were compiled and stored in the WATSTORE system. An approximate potentiometric map for 1978 and an areal-extent map of the High Plains Regional Aquifer were prepared at a scale of 1:250,000. Historical water-level measurements in wells completed in the High Plains Regional Aquifer have been stored in the Ground Water Site Inventory System (System 2000). A base-of-aquifer map was also prepared at a scale of 1:250,000. A related activity carried out under this project in fiscal year 1979 was completed for the Rural Electrication Administration. A report was prepared by D.T. Hoxie on the results of transient simulations of a digital model of the Arikaree aquifer in the vicinity of the Laramie River coal-fired electricity station near Wheatland. Drawdowns and stream depletions were predicted for three different pumping scenarios.

PLANS FOR FISCAL YEAR 1980: Background information for the report in progress will be obtained. Contour maps will be drawn of compiled values of average hydraulic conductivity and specific yield from the High Plains aquifer in Wyoming. Water-use data will be collected during the irrigation season.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Hoxie, D.T., 1979, Results of transient simulations of a digital model of the Arikaree aquifer near Wheatland, southeastern Wyoming: U.S. Geological Survey Open-File Report 79-1280, 17 p.



PROJECT TITLE: Rate of nutrient release from decomposing plankton and periphyton in Lake De Smet and its outflow, north-central Wyoming (WY 78-051).

FUNDING AGENCY: None.

PROJECT LEADER: David J. Wangsness.

FIELD LOCATION: North-central Wyoming.

PERIOD OF PROJECT: September 1978 to September 1979 (incomplete).

PROBLEM: There is a lack of understanding about the amount and rate of nutrient (phosphorus and nitrogen) release during algal cell decomposition in lakes and streams. This kind of information would be useful to water managers. The Lake De Smet system is well suited to this study. Originally an abandoned coal pit, the lake receives most of its inflow by diversions from Piney and Clear Creeks. Lake capacity has been increased by dams and dikes. Outflow for irrigation is controlled.

OBJECTIVE: The objective is to determine the amounts of nutrients released during algal cell decomposition and the rate of nutrient release from blue-green algae and diatoms in stream periphyton and lake plankton.

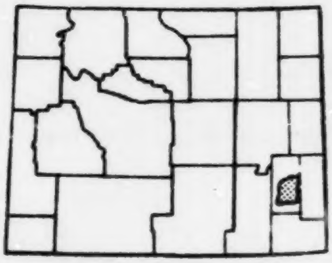
APPROACH: Uniform samples of plankton and periphyton biomass will be collected and placed in duplicate sample bottles. Algal cells will be killed with a photosynthetic inhibitor and the samples incubated in the lake and stream. Every 3 hours for 36 hours, and every 6 hours for the second 36-hour period a sample will be filtered and analyzed for dissolved forms of nitrogen and phosphorus to the microgram per liter level. Additional samples will be analyzed for total nutrients, average sample biomass, specie identification and cell counts. Decomposition rates and total nutrient released will be determined.

PROGRESS AND SIGNIFICANT RESULTS: During fiscal year 1979 the field and lab work for the project were completed. There appeared to be an initial release of ammonia, nitrate, and phosphorus from decomposing algae cells during the first three to six hours of the study, which released two to four times the nutrient concentration to the sample water. This was followed by a more gradual nutrient release during the remainder of the study period. It appears that the cell walls of the test organisms ruptured, initially releasing the rapidly decomposing material from within the cells. This was followed by a more gradual decomposition of the remaining material from within the cells.

PLANS FOR FISCAL YEAR 1980: The final report will be completed and published.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Hydrologic conditions in the Wheatland Flats area, Platte County, Wyoming, Part II (WY 79-052).



FUNDING AGENCIES: Geological Survey, Wyoming Department of Economic Planning and Development, and Wyoming State Engineer.

PROJECT LEADER: Marvin A. Crist.

FIELD LOCATION: Southeastern Wyoming.

PERIOD OF PROJECT: April 1979 to March 1981.

PROBLEM: Water is diverted from the Laramie River to irrigate approximately 40,000 acres of land in the Wheatland Flats area. Ground water is the source for an additional 2,000 acres. Adequate supplies of surface water are available only in years when stream runoff is above normal. Additional water is provided by wells. The increase in irrigation wells from about 85 in 1960 to about 225 in 1978 has resulted in substantially more pumpage of ground water. Consequently some of the shallow wells are no longer productive. Information is needed to determine the effect of ground-water development upon water levels and streamflow.

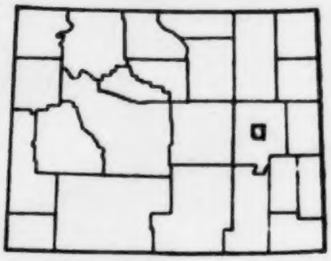
OBJECTIVE: The objectives are to (1) determine the extent of present ground-water development for irrigation, industry, and municipal use and describe the effect of this development upon water levels in the separate aquifers; (2) determine the effect of imported surface water upon water levels and the effect of imported water and ground-water development upon stream discharge in the area; and (3) provide a means of predicting the effect of water-management decisions.

APPROACH: Well-inventory, pumpage, and surface-water use data will be updated. Additional data will be collected to include the adjacent area around Wheatland Flats where irrigation wells have been constructed. An observation-well network will be established and mass water-level measurements will be made in the spring prior to start of irrigation. Seepage runs will be made on all the streams to estimate stream-aquifer relationship. Preparation of a water budget will aid in the development of a digital model of the hydrologic system, which will be tied in with two existing models for adjacent areas.

PROGRESS AND SIGNIFICANT RESULTS: Mass water-level measurements were made in April prior to the start of irrigation. An observation-well network was established whereby water levels are measured monthly. Two digital recorders were installed, one on an existing well in the alluvium and the other in a well drilled to monitor the deeper water level in the Arikaree Formation. Work was started on preparation of potentiometric-surface maps and on the inventory of all large-capacity wells. Stream discharge was measured monthly on the three streams in the area by Wyoming State Engineer personnel. Profiles were augered across the three stream valleys at six locations to determine the lithology and thickness of the alluvium.

PLANS FOR FISCAL YEAR 1980: The compilation of data will be finished and work started on the development of a digital model of the ground- and surface-water system in the area.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Hydrologic reconnaissance of the Powder River Basin Uranium District, Wyoming (WY 80-053).

FUNDING AGENCY: Geological Survey.

PROJECT LEADER: James R. Marie.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: January to September 1980.

PROBLEM: The U.S. Geological Survey does not have the hydrologic data base to develop a substantiated concept of how the hydrologic system functions in the uranium area to define impacts associated with uranium exploration and mining activities. Also, a number of alleged conditions, which may or may not be problems and may or may not be severe, should be investigated to define their true nature. These conditions could have significant impact and include (1) drastic lowering of water levels in the aquifers underlying the area, (2) excursions of lixiviant from in-situ mines, (3) impacts of inter-aquifer flow caused by many unplugged drill holes, (4) impacts of mine water used for crop irrigation, (5) lack of mining industry water-requirement information, and (6) lack of natural (native) water-quality information.

OBJECTIVE: The objectives of this study are to (1) develop valid, substantiated concepts of how the hydrologic system functions in the uranium area; (2) gather enough information to determine if any or all of the conditions outlined above do, in fact, exist and are significant enough to require further investigation; (3) submit appropriate project proposals to investigate those problems requiring solution; and (4) publish all information developed during this study in an appropriate report.

APPROACH: Substantiated concepts of how the hydrologic system functions and geologic, hydraulic, and potential information will be gathered. Then enough information on each of the conditions outlined above (Problem) will be assembled to determine if, in fact, they are real and then to determine if they are significant enough to require federal effort for their resolution. If any of the problems appear to require additional effort, appropriate work will be proposed.

PLANS FOR FISCAL YEAR 1980: The first priority will be to complete a literature and file search. All involved state agencies and mining companies have agreed to furnish the Survey with available hydrologic information or to allow access to their files. The second priority will be to develop a substantiated concept of how the hydrologic system functions in the area. Next, a water-quality reconnaissance will be made of streams receiving uranium-process water and/or flow from dewatering operations. This reconnaissance will help define radiochemical and trace-element concentrations. Ranchers in the area will be contacted to obtain first-hand information of the water-level declines. Geologic, hydraulic-head, and water-quality information will be examined in order to evaluate the possibility of inter-aquifer flow. Quantities of water produced or planned to be produced by mine dewatering and the amounts needed for uranium processing will be defined in order to determine if a ground-water flow model will be necessary to define the impacts on the hydrologic system. If any of these topics appear to require additional effort, appropriate work will be proposed. A summary report will be submitted for review.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Precipitation, infiltration, and runoff relations for small basins in Wyoming (WY 80-054).

FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: James G. Rankl.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: January 1980 to September 1982.

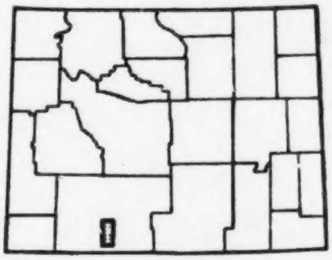
PROBLEM: Federal regulations concerning surface coal mining and reclamation operations specify use of precipitation-frequency criteria for hydraulic design. The problem is to determine runoff volumes from small drainage basins for selected precipitation frequencies. Variability of infiltration rates of soil and other surficial material requires an understanding of the hydrologic processes controlling the relations of precipitation, infiltration, and runoff in small drainage basins.

OBJECTIVE: The objectives of this study are to define infiltration-rate curves for soils and other surficial materials and determine the relations between infiltration rates computed from basin studies and those computed from infiltration tests.

APPROACH: Existing rainfall-runoff data collected at small ephemeral basins will be used with Soil Conservation Service soil maps and descriptions to define infiltration-rate curves. Infiltromoter data will be collected using a hand-portable model developed by McQueen (USGS) and the rainfall simulator of the USGS Public Lands Hydrology Program. These data will be analyzed statistically and compared to basin runoff.

PLANS FOR FISCAL YEAR 1980: Plans are to develop infiltration-rate curves for small basins in the Hanna area of Wyoming and to run infiltrometer tests on Dugout Creek tributary near Midwest, Wyoming. From these data a sample size will be established for infiltrometer tests for the remainder of the project.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Quality of runoff from small basins in plains areas--Wyoming (WY 80-055).

FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Lewis L. DeLong.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: January 1980 to September 1981.

PROBLEM: Most energy-mineral development in Wyoming is planned for plains areas characterized by ephemeral and intermittent streams. Because of the flashy nature of precipitation and streamflow in these areas, water quality is highly variable and difficult to measure or predict. Routine, periodic sampling does not adequately describe base-line conditions or processes involved in the divestment and transport of waterborne constituents.

OBJECTIVE: The specific objectives of this study are to identify dominant processes involved in the divestment and transport of major dissolved salts within a small basin and to document the methods of short-term data collection and interpretation used so that they may be applied to other similar basins.

APPROACH: Streamflow and water-quality data will be collected intensively during runoff events. Multiple samples will be collected along stream reaches. Mass balances computed at sampling sites will be used to determine sources and sinks of salts in intervening reaches thus identifying the dominant processes by which constituents become waterborne and are transported. Streamflow and specific-conductance data recorded continuously at a downstream location will be analyzed on an event basis to determine the relation of total salt load to total runoff volume and time elapsed between events. This will help to determine the dependence of those processes identified on antecedent conditions. The final report will document the processes identified and the methods of data collection and interpretation utilized.

PLANS FOR FISCAL YEAR 1980: The first year of the project will include project planning, site selection, data collection, and interpretation of available continuous monitor data.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Streamflow characteristics of energy-mineral areas in Wyoming (WY 80-056).

FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Hugh W. Lowham.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: March 1980 to February 1982.

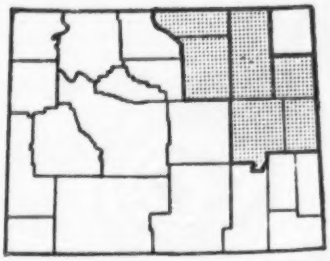
PROBLEM: Substantial development of mineral resources is occurring in Wyoming. Planning and design related to such developments often require information concerning streamflow characteristics. Gaged data are sparse for the arid and semiarid areas where most of the energy-mineral development is occurring. Techniques for transferring or estimating streamflow information are therefore required. Existing techniques for estimating flow characteristics are limited mainly to peak flows. More complete information is needed concerning annual and seasonal runoffs.

OBJECTIVES: This study will help solve problems currently being encountered in estimating runoff of arid and semiarid energy-mineral areas. Specific objectives are to (1) develop techniques and relations for estimating monthly and annual runoff with greater accuracy than now possible, and (2) refine relations for estimating peak flows for streams in these areas.

APPROACH: Existing techniques for estimating flow characteristics in Wyoming were developed using streamflow data available through 1973. Since then many new gaging stations have been established in the plains areas; those having suitable records will be included in the analysis. Because runoff from plains areas is highly variable, regional-analysis techniques will be developed considering average characteristics for groups of stations, with minimum reliance on individual short-term records. Regression techniques using basin features and channel-geometry measurements will be used in the analysis. Also, relations showing seasonal runoffs derived from an analysis of snowmelt and rainfall contributions will be investigated. The use of streambed-material size to improve channel-geometry relations will be examined.

PLANS FOR FISCAL YEAR 1980: A literature search will be made, surface-water specialists at headquarters and region will be consulted, and a detailed study plan will be prepared. Surface-water and weather stations will be identified for use in the analysis. Gaged data will be compiled. Streambed samples will be collected and channel geometry measured. Distributions of monthly and annual runoffs will be investigated.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.



PROJECT TITLE: Biological communities of small streams in Wyoming (WY 80-057).

FUNDING AGENCY: Geological Survey.

PROJECT LEADER: David A. Peterson.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: January 1980 to September 1981.

PROBLEM: The existing and potential development of energy minerals and water resources of the Powder River Basin has created great interest in the biologic communities of this area. Federal and State regulatory agencies and land-use planners are handicapped by a lack of published information and independent study of the biologic communities in the small streams of this area.

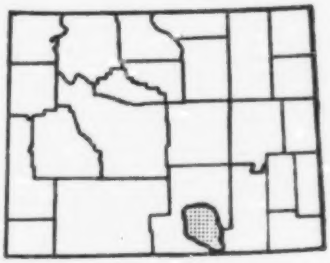
OBJECTIVE: The study objective is to define the biologic communities and their interrelated stream environments in a manner useful to regulatory agencies and land-use planning groups. An attempt will be made to determine which, if any, aquatic organisms are unique to alluvial valley floors, and whether they form a recognizable community that could be used in identification of alluvial valley floors. The occurrence of biologic communities restricted to a flowing-water habitat and their potential for re-establishment following a disturbance will be assessed.

APPROACH: Invertebrate samples will be collected using a variety of samplers and techniques to obtain the best measure of community composition. Samples of periphyton, phytoplankton, macrophytes, and organic matter in the water and within the substrate will be used to compare food resources and habitat differences. Physical and chemical measurements of the habitats will be compared to help isolate critical factors in community development. Biologic characteristics of streams affected by energy-mineral development will be compared with otherwise similar streams that are not affected. The final report will discuss the results in terms of balanced communities, specific organisms, and productivity and diversity of the communities.

PLANS FOR FISCAL YEAR 1980: A literature search will be made and project planning will be completed. Samples of phytoplankton, periphyton, invertebrates, bed material, vertebrates, and macrophytes will be collected, cleaned, sorted, and identified. Diversity indices will be calculated for the invertebrates.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Reconnaissance of the water resources of the Saratoga Valley, south-central Wyoming (WY 80-058).



FUNDING AGENCIES: Geological Survey and Wyoming State Engineer.

PROJECT LEADER: Leslie W. Lenfest, Jr.

FIELD LOCATION: South-central Wyoming.

PERIOD OF PROJECT: March 1980 to September 1981.

PROBLEM: Recent increases in the development of water resources in the Saratoga Valley necessitate a better appraisal of the resources available and of the extent to which development is taking place. This information is needed by the Wyoming State Engineer's office to carry out its regulatory functions. Definition of the hydrologic system is needed and would include hydraulic properties and head in the aquifer, hydraulic head between aquifers, stream-aquifer relationships, irrigation and precipitation recharge of the aquifer, and the response of the aquifers to pumpage.

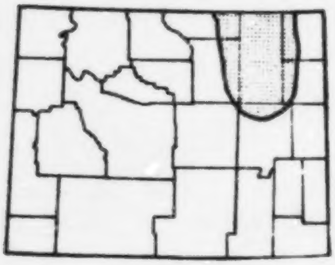
OBJECTIVE: The objectives are to (1) determine the present status of groundwater development, and the hydrology and hydraulic properties of the aquifers within the study area, based on the collected data; and (2) evaluate the need for additional studies and, if needed, recommend an approach for further investigations.

APPROACH: An inventory will be made of wells from documented information and field reconnaissance. A water-level network will be designed that consists of 20 to 25 wells to be measured monthly. A mass water-level measurement of all wells will be done to establish water levels and to monitor water-level changes in areas of extensive pumpage. An inventory of irrigated acreage will be made using infrared photographs and field reconnaissance. Seepage runs will be made to estimate stream-aquifer relationships. Tests will be done to determine hydraulic properties of aquifers.

PLANS FOR FISCAL YEAR 1980: Initially, a literature search for existing information and data for the study area will be conducted. A preliminary field reconnaissance will be made of the valley as well as subsequent data-gathering field trips. A water-level network consisting of 20 to 25 wells will be designed for the collection of ground-water head data. If wells are not available in particular areas of interest, some new wells will be drilled. Areas of irrigation will be determined from field investigations and BLM infrared photographs. Surface geology maps will be determined from available data.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

Water-Resources Projects Conducted by other Districts



PROJECT TITLE: Effects of mining and related activities on the shallow ground-water system (MT 75-048).

FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Steven E. Slagle.
(Helena, Montana)

FIELD LOCATION: Eastern Montana and northeastern Wyoming.

PERIOD OF PROJECT: July 1974 to October 1979.

PROBLEM: Strip mining and the related aspects of coal development can be expected to cause ground-water levels and ground-water quality to change. The public, industry, and government need to know the extent of change in order to take and enforce mitigating measures. Water availability and water quality need to be known in order for other agencies to evaluate alternative sources of water.

OBJECTIVE: The major objectives are to (1) define and understand the regional and local flow systems in aquifers above the Pierre Shale; (2) develop a semi-quantitative conceptual model as a basis for predictive models, (3) develop predictive models to assess the effects of mining on water levels and the yield of wells and springs; (4) develop "first estimate" water-quality models to predict rate and direction of movement of poor quality water from spoil banks and other sources; (5) utilize all of the models to evaluate and revise the data-collection program; and (6) assure that the data-collection and interpretation (modeling) programs meet the needs of other federal and state agencies.

APPROACH: The accumulated geologic and hydrologic information will be combined to develop conceptual models of the hydrologic system on both large and small scales. Additional data needed for more complete understanding of the hydrologic system will be collected. Digital models will be developed, first to test and modify the concepts and evaluate the data-collection network, then to predict the effects of mining and related activities on ground-water levels and the discharge of springs. Using the hydraulic models, development of water-quality models will be attempted to determine or predict leachate migration and the movement of other poor-quality water.

PROGRESS AND SIGNIFICANT RESULTS: Basic data reports for wells and water quality was completed. Reports on ground-water quality, base-flow of streams, surface-water discharge and surface-water quality are in review.

PLANS FOR FISCAL YEAR 1980: The final report will be completed and submited to the Director for approval.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

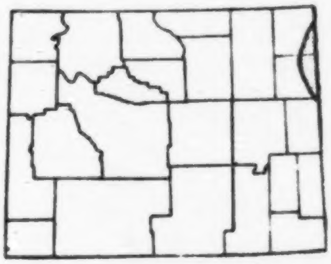
Knapton, J.R., and McKinley, P.W., Water quality of selected streams in the coal area of southeastern Montana: U.S. Geological Survey Water-Resources Investigations 77-80.

Lee, R.W., Ground-water-quality data from the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Open-File Report 79-1331.

McKinley, P.W., Water quality of selected streams in the coal area of east-central Montana: U.S. Geological Survey Water-Resources Investigations 78-142.

Slagle, S.E., and Stimson, J.R., Hydrogeologic data from the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Open-File Report 79-1332.

PROJECT TITLE: Hydrology of the aquifer(s) in the Madison Group (SD 76-043).[1]



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Lewis W. Howells.
(Huron, South Dakota)

FIELD LOCATION: Northeastern Wyoming and western South Dakota.

PERIOD OF PROJECT: July 1975 to June 1980.

PROBLEM: New withdrawals of water from the aquifer(s) in the Madison Group for existing and proposed mining and industrial facilities could greatly exceed 100,000 acre-ft per year within five years. Some concerned persons, including public officials, fear that the aquifer is incapable of supporting a sustained yield of that magnitude and that severe damage may result to other water users in the region.

The problem, therefore, is to delineate the magnitude and distribution (both in space and time) of the water resources in the Madison, and to determine the response of the aquifer to proposed withdrawals of water.

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[1] This project is subsidiary to project CR 76-192, described on page 112.

OBJECTIVE: The objectives of the study are to (1) delineate the water resource(s) contained in or intergrally related to the Madison Group in South Dakota; (2) determine the hydrologic regimen of the aquifer(s), with special emphasis on the surface- and ground-water relationship in areas of outcrop, of the aquifer(s) in the Madison Group and to those in underlying limestone rocks of Paleozoic age and of the overlying Minnelusa Formation; and (3) predict the probable results of removal of large amounts of water from the Madison.

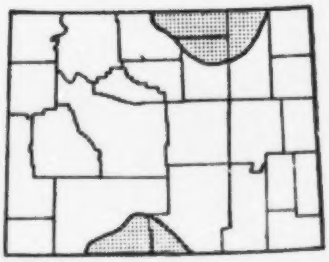
APPROACH: Records, data, and other information available from public and private sources will be collected, evaluated, and interpreted, including analysis of drill-stem test data by a professional analyst. A data-collection network will be established and operated to meet the objectives of the project. Test drilling, dye tracer tests, aquifer tests, geophysical studies, and other tests and studies will be conducted as needed and feasible. Information will be interpreted and reports prepared that include structure, isopach, potentiometric, and geochemical maps, and predictions of probable effects of various patterns and magnitude of water resources development. Predictions will be refined from new information available from the data-collection network.

PROGRESS AND SIGNIFICANT RESULTS: The canvass of wells is complete except for those currently being drilled. Twenty-five additional water samples have been collected. Conversion of well records to System 2000 is completed except for the wells currently being drilled.

PLANS FOR FISCAL YEAR 1980: Compilation and evaluation of data will continue. Gaging stations will be operated and the water-level monitoring program will continue. Ground-water samples will be collected and analyzed from any new wells that are drilled. Coding and conversion of records to ADP will be completed. The preparation of structure and isopach maps will be completed.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

PROJECT TITLE: Hydraulic and geomorphic characteristics of stable alluvial stream channels in the Rocky Mountain Region (CO 79-119).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Edmund D. Andrews.
(Lakewood, Colorado)

FIELD LOCATION: Northeastern and south-central Wyoming.

PERIOD OF PROJECT: February 1979 to February 1982.

PROBLEM: Development of coal and oil-shale resources in the Rocky Mountain Region by surface-mining techniques during the 1980's will disturb large areas of land. As a result, the hydrologic balance of many streams will be altered, and, in some instances, completely destroyed during mining. In order to protect and restore the hydrologic balance of these stream channels, it is necessary to acquire detailed knowledge of the hydraulic and geomorphic factors that control the stability of alluvial streams in the region.

OBJECTIVE: Consistent hydraulic and geomorphic relations will be developed that are indicative of stream-channel stability. These relations will link the sediment and water discharge of a stream with the values of velocity, depth, width, roughness, slope, and sinuosity required to maintain stability. Data collection and analysis will be directed toward determining the hydraulic and geomorphic factors that affect alluvial-channel stability and the amount of time required for a stream to adjust to a change in quantity of water and sediment supplied to it from the watershed.

APPROACH: Historic data such as streamflow gaging-station records, stream-channel surveys, sediment-concentration and load records, and reports describing stream-channel adjustments to long-term changes in discharge will be collated. Additional data will be collected as needed.

PROGRESS AND SIGNIFICANT RESULTS: Methods for determining total bed-material discharge of streams with various size distributions of bed material have been evaluated.

PLANS FOR FISCAL YEAR 1980: The hydraulic adjustment of streams with poorly sorted bed material will be determined. Relationships between flow characteristics and the supply of water and sediment to the stream channel will be developed.

REPORTS PUBLISHED DURING FISCAL YEAR 1979: None.

Water-Resources Projects Conducted by Central Region Staff

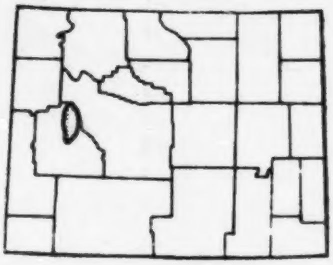
PROJECT TITLE: Bedload transport research (CR 74-187).

FUNDING AGENCY: Geological Survey.

PROJECT LEADER: William W. Emmett.
(Lakewood, Colorado)

FIELD LOCATION: West-central Wyoming.

PERIOD OF PROJECT: July 1973 (continuous).



PROBLEM: Of all processes operating in river channels, especially those of practical concern to engineers and others interested in river channel behavior, perhaps the least knowledge is available about the hydraulics and mechanics of bedload transport. Before continuing advances in river channel behavior can be made, some understanding of the behavior of bedload sediment must be made.

OBJECTIVE: The objectives are to (1) define spatial and temporal variations in bedload transport rate for a single stage of flow; (2) define change in average magnitude of transport rate over a range in hydraulics of flow; (3) define change in average magnitude of transport rate over a range in channel geometry; and (4) analyze the data to evaluate the applicability of available bedload equations, suggest new coefficients for the existing equations, or propose new relations for predicting rates of bedload transport.

APPROACH: The conveyor-belt bedload-transport facility on the East Fork River near Pinedale, Wyoming will be used as a control to evaluate variability factors in bedload transport and to field calibrate the Helley-Smith bedload sampler. The calibrated Helley-Smith sampler will be used in the systematic collection of bedload samples, along with the concurrent measurements of streamflow hydraulics from a variety of sand- and gravel-bed streams. Within the laws of general physics, empirical relations of bedload transport will be stochastically developed and the physical significance of the developed relations will be interpreted.

PROGRESS AND SIGNIFICANT RESULTS: A tracer study utilizing fluorescent particles was initiated at the conveyor-belt bedload-trap research facility to evaluate (1) residence time of sediment, (2) average speed of particles, (3) depth of bed material involved in transport, (4) dispersion of bed material, (5) short-term channel changes accompanying sediment transport, and (6) influence of availability of sediment on transport rate, and other related aspects of sediment transport. Quality results are known, and quantitative information is pending upon completion of detailed laboratory analysis of collected samples and computer manipulation of data.

PLANS FOR FISCAL YEAR 1980: An image analyzer will be used to determine particle sizes and concentration of fluorescent particles in (1) samples collected describing the stationary environment and (2) samples collected describing the material in transport. This information will be used to refine a field procedure for an additional year of data collection as generalized above. The Helley-Smith bedload sampler will be used at a variety of rivers to enlarge the data base necessary to extrapolate the specific information of the East Fork River tracer study to a universal application.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

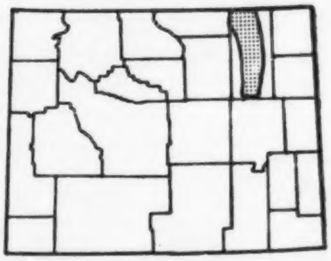
Emmett, W.W., and Thomas, W.A., 1978, Scour and deposition in Lower Granite Reservoir, Snake and Clearwater Rivers near Lewiston, Idaho, U.S.A.: Journal of Hydraulic Research, v. 16, no. 4, pp. 327-345.

Emmett, W.W., 1979, A field calibration of the sediment trapping characteristics of the Helley-Smith bedload sampler: U.S. Geological Survey Open-File Report 79-411, 96 p.

_____, 1979, Aspects of bedload transport in rivers (ABS.): Program with abstracts, 32nd Annual Meeting, Rocky Mountain Section, Geological Society of America, v. 11, no. 6, p. 271.

Burrows, R.L., Parks, Bruce, and Emmett, W.W., 1979, Sediment transport in the Tanana River in the vicinity of Fairbanks, Alaska, 1977-78: U.S. Geological Survey Open-File Report 79-1539, 37 p.

PROJECT TITLE: Reconnaissance techniques for evaluation of rehabilitation potential of energy resource lands (CR 75-104).



FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Lynn M. Shown.
(Lakewood, Colorado)

FIELD LOCATION: White Tail Butte EMRIA site, northeastern Wyoming.

PERIOD OF PROJECT: July 1974 to September 1979.

PROBLEM: Hydrologic information with respect to rehabilitation potential is needed by local, state and federal governments, private landowners, energy companies, and others prior to decisions on the leasing, mining plans, and mining of publicly-owned coal and oil shale. The information is needed over the next 1 to 5 years, so reconnaissance techniques must be used to obtain much of the necessary data. The two facets of the problem are: (1) To define the baseline conditions as they exist prior to mining, mostly in areas having sparse hydrologic data; and (2) to assess the potential for rehabilitation of the land-water system after mining.

OBJECTIVES: The purpose of this project will be to refine and apply reconnaissance techniques that will provide mappable and other easily assimilated information to be used as baseline data and in evaluating the rehabilitation potential of lands where energy resource mining and other land-use changes are proposed and in development, verification, and application of hydrologic process and regression models. Data to be collected and interpreted include: Mean annual runoff, 2-, 5-, and 10-year peak flows, sediment yields, soil-vegetation-water relations, slope and exposure effects on vegetation and hydrology, reconstruction of topography after assumed mining, channel and hillslope erosion, and channel condition.

APPROACH: The techniques to be used to characterize watersheds of various sizes are (1) soil-moisture storage associated with vegetation types; (2) estimates of annual runoff by subtracting soil-moisture storage from annual precipitation; (3) the relation of percent bare soil to runoff and sediment yields; (4) index of erodibility by water dispersion; (5) estimates of annual runoff and peak discharges using channel measurements; (6) estimates of sediment yield using climate, drainage basin characteristics, and reservoir sediment surveys; (7) erosion monitoring by resurveying monumented transects; and (8) hillslope, channel, and geologic cross-section analysis with respect to reconstruction of the topography of potential mine areas. Soils, vegetation and runoff and erosion of nearby mine spoils in various states of rehabilitation will be investigated.

PROGRESS AND SIGNIFICANT RESULTS: Sediment surveys of 3 stock ponds and channel-geometry measurements at 20 cross sections were completed in the Coal Creek, Oklahoma, Energy Minerals Resource Inventory and Analysis - a Bureau of Land Management program (EMRIA) basin that is being modeled. Vegetation maps were completed for the Coal Creek basin and for the Prairie Dog Creek, Montana EMRIA basin. Sampling and analyses were done to define soil-moisture relations for 11 soils in the Yellow Creek EMRIA basin in Alabama. Infiltration and soil detachability measurements were made with a portable rainfall simulating infiltrometer at the Bisti West and Ah-shi-sle-pah Wash EMRIA basins in cooperation with the New Mexico WRD District. Three comprehensive reports demonstrating hydrologic methodology data analyses, and information useful for determining impacts of surface mining and reclamation were prepared. These reports were requested by the Office of Surface Mining Reclamation and Enforcement (OSM) and were done for potential mine sites in southeastern Montana, south-central Wyoming, and northwestern New Mexico. The last two runoff/erosion plots in the Piceance basin, Colorado were abandoned owing to encroaching development on Oil Shale Tract Co. Channel cross sections on Corral Gulch were resurveyed twice where flows occur resulting from dewatering of aquifers of Oil Shale Tract Co. The complete network of channel cross sections and slope erosion transects in the Piceance basin were resurveyed.

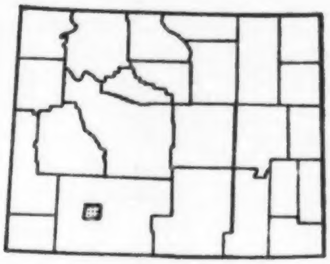
PLANS FOR FISCAL YEAR 1980: Several types of data will be collected in the Yellow Creek and Bear Creek, Alabama basins, which are to be modeled. Data collection will include mapping and measurement of vegetation, additional soil-moisture and bulk-density sampling, sediment surveys of two or three ponds downstream of mined areas, channel-geometry measurements, and reconnaissance of the hydrology of Warrior Coalfield. A report will be prepared for OSM on the hydrologic effects of surface mining and reclamation for a potential mine site in the Yellow Creek basin. Sediment surveys are planned for several stock ponds in the Prairie Dog Creek, Montana basin. Erosion monitoring will be continued in the Piceance basin.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Ringen, B.H., Shown, L.M., Hadley, R.F., and Hinkley, T.K., 1979, Effect on sediment yield and water quality of a nonrehabilitated surface mine in north-central Wyoming: U.S. Geological Survey Water Resources Investigations 79-47, 23 p.

U.S. Department of the Interior, Geological Survey, 1978, Moisture relations in soils, vegetation, and sediment yields, in Resource and Potential Reclamation Evaluation-Hanging Woman Creek Study Area: Bureau of Land Management EMRIA Report No. 12, 1977, 309 p.

PROJECT TITLE: Sorption of residual organic substances in retort waters by spent oil-shale residues (CR 75-181).



FUNDING AGENCY: Department of Energy (Laramie Energy Research Center).

PROJECT LEADER: Jerry A. Leenheer.
(Lakewood, Colorado)

FIELD LOCATION: Southwestern Wyoming (Rock Springs LERC oil-shale retorting site).

PERIOD OF PROJECT: 1975 to September 1980.

PROBLEM: In-situ oil-shale retorting produces 1 to 5 barrels of wastewater per barrel of oil. This wastewater is the result of free water contained in the oil shale, the dehydration and dehydroxylation of oil shale minerals at the high temperatures of the retorting process, and the partial combustion of the kerogen which produces retort water. The water-oil mixture is an emulsion which is physically separated after pumping from the in-situ retort, and the wastewater is a brown solution containing 500 to 1,000 milligrams per liter dissolved organic carbon.

Because the wastewater must be handled at land surface during oil production, there is some potential for wastewater contact with the soils present at the retort site. Because of concern about the nutrient and toxilogical aspects of the constituents dissolved in the wastewaters, it is important to understand and measure the chemical and physical interactions between the soil and the wastewater.

The wastewater may be disposed at land surface by using various waste treatment processes, or it may be disposed in the subsurface via injection wells. Because of the concern about the toxilogical aspects of these waste organic solutes, the waste-treatment process selected for use is partially contingent upon the rate of transport of these organic solutes in surface and ground waters after their disposal. Organic solute transport is governed by the rate of water movement, and by solute sorption upon soils, sediments, and aquifer material.

OBJECTIVE: The objective of the proposed research is to determine the chemical and physical effects of soil upon the wastewater composition and wastewater upon soil composition, and to determine the type and magnitude of the organic solute sorption processes which occur upon soil and sediment sorbents associated with the disposal of in-situ-produced wastewater.

APPROACH: This investigation will be conducted using the wastewaters, natural waters, soils, and sediments associated with the experimental in-situ oil-shale retorting site of the Laramie Energy Research Center, Department of Energy, located near Rock Springs, Wyoming. All waters, soils, and sediments will be supplied by personnel of the Laramie Energy Research Center.

The proposed investigation will directly study only the chemical and physical aspects of soil-wastewater interactions. Also, the sorptive properties of unconsolidated soils and sediment sampled at land surface will be characterized by running adsorption isotherms by the batch process of both fractionated and unfractionated wastewater using dissolved organic carbon to quantify the organic solute concentration. The fractionation procedure (Leenheer and Huffman, 1976) typifies the sorptive interactions of the organic solutes into six characteristic fractions.

PROGRESS AND SIGNIFICANT RESULTS: Oil-shale-retort water passed through a soil column caused calcite precipitation in the soil, extracted soil humic and fulvic acids, and the soil sorbed most of the ammonia from retort water. Distilled water, passed through the column after the column had equilibrated with retort water, dispersed the soil such that the soil became impermeable. These soil-retort-water interactions are expected to occur in the event of a retort-water spill on soil followed by rainfall leaching and runoff. A rapid assay based on liquid chromatography for aromatic amines in oil-shale-retort waters was developed. The majority of the aromatic amines in retort waters consist of low molecular-weight anilines, pyridines, and quinolines. Higher molecular-weight aromatic amines known to be mutagenic were not found in significant concentrations in retort water; they were found to occur in shale oil.

PLANS FOR FISCAL YEAR 1980: The main effort will continue to be a study of soil-retort-water interactions through the construction of large-scale soil columns needed to better evaluate heterogeneous soil systems. Changes in organic, inorganic, and trace-metal solute composition will be determined after passage of retort water through the columns. A preparative-scale dissolved-organic-carbon fractionation scheme for retort waters will be developed to prepare gram-sized organic solute fractions for mutagenicity testing. Lastly, a wide variety of waste waters generated by oil-shale retorting, tar-sands retorting, and in-situ coal gasification will be assayed for aromatic amine composition.

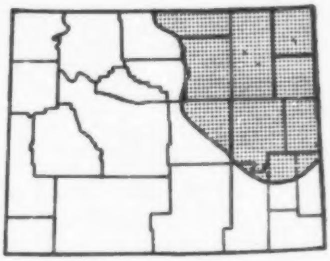
REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Casterline, C.E., and Leenheer, J.A., 1979, Determination of dissolved organic carbon in Methanol: American Lab, v. 11, no. 5, pp 33-39, 7 p.

Cowling, S.W., and MacCarthy, P., 1979, Evaluation of processed oil shale and sediments as sorbents for waste organic solutes produced by in-situ oil-shale retorting, Final report on U.S. Geological Survey grant No. 14-08-0001-G-450 to Colorado School of Mines, 124 p.

Leenheer, J.A., and Huffman, E.W.D., Jr., 1978, Analytical method for dissolved-organic-carbon fractionation: U.S. Geological Survey Water Resources Investigations, No. 79-4, 16 p.

PROJECT TITLE: Hydrology of the Madison Limestone and associated rocks in parts of Montana, North Dakota, South Dakota, and Wyoming (CR 76-192).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Elliot M. Cushing.
(Lakewood, Colorado)

FIELD LOCATION: Northeastern Wyoming, southeastern Montana, southwestern North Dakota, and northwestern South Dakota.

PERIOD OF PROJECT: December 1975 to September 1980.

PROBLEM: Major development of coal within the area will place a heavy demand on the area's limited water resources. The surface water is poorly distributed in time and space. It is fully appropriated in part of the area, and in the rest of the area its use will require storage reservoirs and distribution systems. Preliminary studies indicate that the Madison Limestone and associated rocks might provide a significant percentage of the total water requirements for coal development. However, the effects of large sustained withdrawals of water from these rocks on the hydrologic system are not known.

OBJECTIVE: The quantity of water that may be available from the Madison will be evaluated, the chemical and physical properties of the water defined. The effects of existing developments on potentiometric head, storage, recharge and discharge, spring flow and streamflow, and pattern of groundwater flow will be determined. Possible hydrologic effects of proposed withdrawals of water for large-scale developments at selected rates and locations will be predicted. Better locations for wells will be determined and also the type of construction and development of deep wells to obtain optimum yields. A network of observation wells and streamflow gages will be designed to monitor effects of additional developments on the hydrologic system.

APPROACH: Available geologic and hydrologic data, prior studies, and oil company information will be compiled and evaluated. Borehole and surface geophysical information and other pertinent data will be purchased from oil companies. Structure and stratigraphy will be defined, and aquifer boundaries and geologic parameters that control permeability will be determined. These parameters will be translated in hydrologic terms. A test-drilling program will be designed and the aquifer will be drilled and tested. The preliminary digital simulation model of the system will be refined, and a monitoring network will be designed. Predictions will be made about the possible effects of various patterns of water-supply development on potentiometric surface, recharge, discharge, springs, streamflow, and water quality. The monitoring network will be operated and the predictions will be refined.

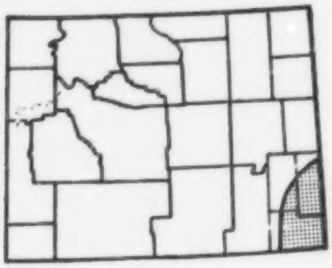
PROGRESS AND SIGNIFICANT RESULTS: Tectonic and structure analysis of Madison Group and associated rocks, preliminary structure and lithofacies maps, geochemical and subsurface geophysical studies, and selected Rwa, temperature, and potentiometric maps were completed. Geohydrologic data for the Madison has been evaluated and entered into the computer model, and preliminary model runs have been made. Madison Limestone test well 3 was drilled to a depth of 7,190 feet. During September the three zones perforated in this well were acid fractured and the total flow from the well was increased from 122 to about 2,600 gallons per minute.

PLANS FOR FISCAL YEAR 1980: A large-scale digital model for the Paleozoic section of the project area will be developed. Project will be completed, including reports on the geology, geochemistry, and hydrology of the Madison Limestone and associated rocks.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Blankennagel, R.K., Howells, L.W., Miller, W.R., and Hansen, C.V., 1979, Preliminary data for Madison Limestone test well 3, NW¼SE¼ sec.35, T. 2 N., R. 27 E., Yellowstone County, Montana: U.S. Geological Survey Open-File Report 79-745, 186 p.

PROJECT TITLE: High Plains regional aquifer-system analysis (CR 78-229).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: John B. Weeks.
(Lakewood, Colorado)

FIELD LOCATION: Southeastern Wyoming, south-central South Dakota, Nebraska, eastern Colorado, western Kansas, western Oklahoma, western Texas, and eastern New Mexico.

PERIOD OF PROJECT: Fiscal years 1978 through 1982.

PROBLEM: The High Plains is a discontinuous upland area of about 150,000 mi^2 extending from southern South Dakota to western Texas and eastern New Mexico. The Ogallala Formation is the principal aquifer underlying the High Plains, which includes about 23 percent of the irrigated land in the United States. The aquifer contains on the order of 2 billion acre-ft of water in storage; but, water is being withdrawn for irrigation in excess of the rate of natural replenishment. The economic future of the High Plains and the surrounding region in eight states (Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming) is heavily dependent upon the capacity of the aquifer to sustain withdrawals.

Several water-management options have been proposed, including those to (1) extend the life of the aquifer by artificial recharge, more efficient soil and water-management practices, and limiting annual withdrawal; (2) supplement the water in the region by weather modification and water importation; and (3) allow unrestricted water use Local, regional, and National interests are vitally concerned about the future of the ground-water supply and its impact on the economy of the region. A comprehensive knowledge of the hydrologic system of the High Plains is required so that water-management alternatives can be evaluated and the economic life of the aquifer can be projected.

OBJECTIVE: The objectives of the study of the High Plains aquifer system are to (1) describe the water resource and the operation of the hydrologic system; (2) develop a regional water-resources (and related) data storage and retrieval system; (3) design and develop a digital computer model (or models) of the High Plains aquifer system; and (4) evaluate selected ground-water management alternatives to demonstrate the applicability of the model (or models) and provide a hydrologic basis for the economic evaluation of management alternatives.

APPROACH: The objectives of the study will be accomplished through (1) the assembly, compilation, and analysis of existing data; (2) the collection and analysis of data designed to provide information on parameters for which data are lacking; and (3) the development of computer models. Data collection networks will be initiated in those areas where existing networks are inadequate to quantitatively describe the hydrology of the High Plains. The data compiled and collected will become part of a computerized data-management system which will provide a hydrologic (and related) data file for the entire High Plains region.

The purpose of the computerized data file is twofold. First, the data file will provide all input data necessary for the development of a regional model of ground-water flow in the High Plains aquifer system. Second, the data file will provide all users with hydrologic and related data on a scale suitable for local interpretation and modeling. The data-management file will be maintained on the U.S. Geological Survey computer at National Headquarters (possibly within System 2000) to provide maximum accessibility to the file. It is intended that the data file will be periodically updated and maintained for water-resource management purposes beyond the life of this High Plains aquifer study.

Information for several of the hydrologic parameters needed for modeling is not available in adequate detail to provide regional and (or) historical variations in the value of the parameter. This is particularly true of recharge, pumpage, and specific yield data. For these and other parameters where data are sparse or nonexistent, special investigations will be planned and executed to develop the necessary data or estimation techniques to regionalize the data.

Water-level, pumpage, and recharge records are the primary data sets for which historical data must be developed. It is anticipated that water-level records are generally adequate to describe the historical water-level changes in the Ogallala aquifer. However, it is expected that adequate data are not available to describe historical pumpage or recharge for the aquifer. Existing data collection networks for both water levels and pumpage will be reviewed, revised, and expanded as necessary to provide an accurate and extensive data base for the future. Particular emphasis will be placed on developing a monitoring network for determining annual pumpage and consumptive use.

Data on the regional variation of specific yield are not available and will have to be developed during this study. It is anticipated that several methods for estimating specific yield will be funded and studied by this project. The methods will include both field and computer model studies.

The primary product of this project is a computer model of the High Plains aquifer system capable of predicting the future state of the aquifer system given knowledge of the future stress. It is intended that this model will become a ground-water management tool to aid regional, state, and local planners in assessing the impact of management alternatives on the hydrologic and economic future of the aquifer system. The model (or models) will be developed and tested during this study and used to evaluate selected ground-water management alternatives to demonstrate the applicability of the model.

PROGRESS AND SIGNIFICANT RESULTS: Water-level data for selected times, base-of-aquifer data, and water-quality data were compiled. The data-base management system was designed, and development was 50 percent completed. A test area for collection of pumpage and crop data was selected and field data obtained for the 1979 crop year. A report describing the aquifer system was 80 percent completed.

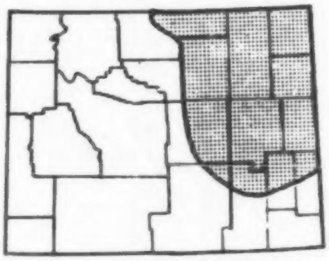
PLANS FOR FISCAL YEAR 1980: Compilation and analysis of data will continue. Data-base management system development and load data will be completed. A report on aquifer description will be completed and regional maps on aquifer base and thickness will be started. Ground-water flow model of aquifer system will be designed. An in-house report on results of collection of water-use data in test area will be prepared.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Gutentag, E.D., Jorgensen, D.G., and Kenny, J.F., 1979, Impact of energy availability on irrigation in western Kansas (ABS.), in Ground Water: National Water Well Association, v. 17, no. 5, p. 498.

Weeks, J.B., 1978, High Plains regional aquifer-system analysis, in Baird, F.L., ed., The multi-faceted water crisis of west Texas; Symposium, Lubbock, Texas, 1978, Proceedings: Lubbock, Texas Tech University, p. 195-201.

PROJECT TITLE: Northern Great Plains Regional Aquifer-System Analysis in Parts of Montana, North Dakota, South Dakota, and Wyoming (CR 78-230).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: George A. Dinwiddie.
(Lakewood, Colorado)

FIELD LOCATION: Northeastern Wyoming, eastern Montana, North Dakota, and South Dakota.

PERIOD OF PROJECT: October 1977 to September 1981.

PROBLEM: Anticipated development of coal, oil, and gas fields and increased demand for water for domestic, agricultural, and municipal uses will require better management of available water supplies. The supply of surface water streamflow, is variable and, at times, undependable. The supply of ground water is not well enough defined to be a predictable supply for long-term use and management.

OBJECTIVE: Objectives of the program to assess the availability of water in the Northern Great Plains are those recommended by the National Water Commission in 1973 in its final report sponsored by the United States Congress, with priorities given to those with falling water tables and deteriorating water quality, are to determine: (1) Aquifer boundaries, thickness, saturation, and transmissivity; (2) the suitability of overlying land and wells for artificial recharge programs; (3) depth of water, quality and temperature of water; (4) the storage capacity at various ground-water levels; (5) the source of pollutants found in the aquifer; (6) natural discharge from the aquifer, principal withdrawals, sources and amounts of recharge, anticipated yields, and the effect of pumping on surface supplies; (7) the extent of past ground-water mining and the estimated economic life of the aquifer under various assumptions as to rates of withdrawal; and (8) the susceptibility of the aquifer to operation and management on a "sustained yield" basis.

APPROACH: The first 9 months of the study is designated for collection of existing geologic, hydrologic, and geochemical data. Report outlines will also be prepared the first year, after data compilation is underway.

Preliminary design of simulation models is scheduled to begin the second half of fiscal year 1978, in order to design the framework of the models, to ascertain needed data for models, and to conduct preliminary simulation of hydrologic systems.

Additional data collection beginning in late fiscal year 1978 includes well and spring inventory, aquifer testing, and gain-and-loss studies. Well and spring inventory are needed in the remote parts of the area to provide data on the potentiometric surface, water quality, water use and discharge, and to identify wells suitable for further testing. Aquifer testing of existing wells will continue for a large part of the project duration in order to obtain data needed for modeling and analytical calculations. Gain-and-loss studies in selected streams are needed in order to identify areas of natural recharge by streams, and discharge to streams for exposed aquifers. Repetitive measurements through a 21-month period permit calculation of rates of recharge and discharge.

Preparation of geologic, hydrologic, and geochemical maps begins in late fiscal year 1978 and continues to the middle of fiscal year 1980. Resulting maps will be published in technical reports and provide input data for hydrologic models, geochemical models, and water-management analyses. Geologic maps include structure-contour maps, tectonic maps, and lithofacies maps. Hydrologic maps include saturated thickness, potentiometric surface, transmissivity, and storage. Geochemical maps include water type as related to flow systems, pollution, and special studies, as needed.

A series of professional papers is proposed to describe results of each project. Chapters of each professional paper would cover the geology, tectonics, hydrology, and geochemistry of each project. A combined report on modeling of the Madison and Northern Great Plains projects is planned in order to describe multilayered system analysis. The modeling report would describe hydrologic and geochemical modeling, including analysis of water-management alternatives.

A preliminary coarse-mesh simulation model will be prepared beginning in fiscal year 1979. The model is proposed to include the following areas: Williston Basin; Power River Basin; Hogeland Basin and north-central Montana; and Bull Mountains Basin. The model will integrate all data and simulate the flow systems, including water quality as related to the flow systems. Carefully prepared and calibrated models will be prepared during fiscal year 1979 and fiscal year 1980. The models form the basis for later water-management studies.

Water-management alternatives will be appraised late in fiscal year 1979 and during most of fiscal year 1980. The effects of normal use, drouth, and coal mining on the aquifers, water quality, and land surface will be simulated.

PROGRESS AND SIGNIFICANT RESULTS: A plan of study was published and staffing was completed. Existing data were assembled in the computer data file in usable format. Stratigraphic correlations have been completed. Sand-thickness, structure, porosity, evaporite-distribution, and isopach maps are in process. Total dissolved-solids, temperature, brine-interface, data-point-distribution, and potentiometric-surface maps have been started. Computer programs for data management, data manipulation, and modeling are completed or are in process.

PLANS FOR FISCAL YEAR 1980: Studies of regional geologic framework, geochemistry, and potentiometric surfaces will continue. Programs will be completed for system modeling and data handling. A first-cut model for the system will be completed.

REPORTS PUBLISHED DURING FISCAL YEAR 1979:

Dinwiddie, George A., and others, 1979, Plan of study for the Northern Great Plains regional aquifer-system analysis in parts of Montana, North Dakota, South Dakota, and Wyoming: U.S. Geological Survey Water Resources Investigations 79-34, 20 p., 2 figs.

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